



## Publications Template

#	Research Title	Field	Abstract	Year of Publication Publishing	Publishing Link "URL"
1	Polyelectrolyte membranes based on phosphorylated-PVA/cellulose acetate for direct methanol fuel cell applications: synthesis, instrumental characterization, and performance testing	Polymer for Fuel cells applications	Designing and synthesis of cost-effective and improved methanol permeable and proton conductive membranes are the main challenges for preparation of polymeric electrolyte membrane (PEM). Herein, a cost-effective PEM membrane based on phosphorylated polyvinyl alcohol (PVA)-grafted-cellulose acetate (CA) was prepared by a solution-casting technique. Water and methanol uptakes of phosphorylated PVA/CA membranes were characterized as function with the molar ratio of CA. Additionally, structure and morphology of phosphorylated PVA/CA (Ph-PVA/CA) membranes were verified by FT-IR analysis, SEM investigation. Furthermore, ion exchange capacity (IEC), proton conductivity and methanol permeation of Ph-PVA/CA membranes were examined based on	2023	<a href="https://doi.org/10.1016/j.memsci.2004.06.032">https://doi.org/10.1016/j.memsci.2004.06.032</a>

			<p>the concentration of OPA basically. The results manifested a perceptible improvement in proton conductivity from 0.035 to 0.05 S/cm at 25 and 70 °C, respectively using 600 µL of OPA, and IEC of 2.1 meq/g using 400 µL of OPA at ambient temperature. On the other hand, methanol permeability (<math>P = 1.08 \times 10^{-10} \text{ cm}^2/\text{s}</math>) was lower than Nafion 117 admirably. The optimum OPA concentration was 200 µL according to conductivity measurements (at 10% PVA, 150 µL GA, and CA 7%). Finally, prepared Ph-PVA/CA membranes exhibited enhancement in critical natures such as proton conductivity and IEC combined with its low-cost materials, which make them excellent candidate as PEM for DMFCs application.</p>		
2	Preparation and characterization of poly (vinyl alcohol)/Carboxymethyl Cellulose/ Acrylamide - based membranes for DMFC applications	Polymer for Fuel cells applications	<p>Blending polyvinyl alcohol (PVA) - Carboxy methyl cellulose (CMC) - Acrylamide (AA) membranes are prepared and crosslinked using succinic acid and investigated it as a polymer electrolyte membrane (PEM) in direct methanol fuel cell (DMFC). The membranes were prepared through the solution</p>	2023	<a href="https://doi.org/10.21608/EJCHEM.2023.176338.7218">10.21608/EJCHEM.2023.176338.7218</a>

casting technique. The effect of different blend addition on physicochemical properties was studied. Scanning electron microscopy (SEM) was used to study the morphological structure, which indicated that no phase separation or cracks and good component compatibility. Chemical interaction between PVA, CMC, and AA was confirmed using Fourier transform infrared (FT-IR) in which the four characteristic absorption bands at 572, 1414, 3302 and 3411  $\text{cm}^{-1}$  which confirm the presence of -NCO-, -COO-, -OH and -NH<sub>2</sub>, respectively. Furthermore, mechanical strength, water uptake, gel fraction, and ion exchange capacity (IEC) were determined as functions of varied membrane components. The results revealed that the addition of CMC and AA improves mechanical strength, IEC and protonic conductivity that reached 23.41 MPa, 0.11 mmol/g and  $1 \times 10^{-3}$  S/cm, respectively. Such results enhance the potential feasibility of PVA/CMC/AA hybrid polyelectrolytic membranes for DMFC application.

3	Structure of plasma deposited acrylic acid-allyl alcohol copolymers	Material science	Copolymer thin films with two types of functional groups have excellent performance as sensors, for example. The formation and deposition of allyl alcohol-acrylic acid copolymer films by pulsed high frequency plasma is a complex process. As usual, the chemical composition of the top surface of the films was investigated by XPS and FTIR measurements. Furthermore, contact angle measurements with water were used to characterise the hydrophilicity and wettability of the polymer films. After plasma deposition, a significant decrease in functional groups (OH and COOH) was observed compared to the classically copolymerised equivalent. The remaining functional groups, i.e. the majority of these groups, were sufficient for application as sensor layers. Segmental mobility and conductivity, important for sensor applications, were analysed by broadband dielectric spectroscopy.	2023	<a href="https://doi.org/10.1002/ppap.202300071">https://doi.org/10.1002/ppap.202300071</a>
	Nano-MnO <sub>2</sub> /xanthan gum composite films for NO <sub>2</sub> gas sensing	Sensors	Nowadays, sensors based on polymers/nanostructured <a href="#">metal oxide</a> composites have been investigated extensively because of	2023	<a href="https://doi.org/10.1016/j.matchemphys.2022.127277">https://doi.org/10.1016/j.matchemphys.2022.127277</a>

their sensitivity to NO<sub>2</sub> gas at ambient temperature. In this work, nanocomposite membranes of [xanthan gum](#) (XG) with different contents of MnO<sub>2</sub> [nanoparticles](#) were prepared as a potential NO<sub>2</sub> gas sensor operating at room temperature by a simple one-step oxidation-reduction reaction. The structural, morphological, thermal, and electrical properties of the [composite membrane](#) were investigated. The FT-IR results confirm the successful preparation of MnO<sub>2</sub> through the [oxidation](#) of XG by KMnO<sub>4</sub> and reveal further the structural changes of the XG/MnO<sub>2</sub> nanocomposite upon its exposure to NO<sub>2</sub> gas. The capping of the synthesized MnO<sub>2</sub> nanoparticles by XG, the surface composition of the XG/MnO<sub>2</sub> nanocomposite membranes, and the effect of NO<sub>2</sub> gas on the surface composition was investigated using the [XPS](#) technique. The DC [conductivity](#) and [dielectric](#) loss of nanocomposites were higher than for neat XG. The conductivities of the nanocomposites XG/MO-4,



			XG/MO-4/low NO <sub>2</sub> , and XG/MO-4/high NO <sub>2</sub> composites are half, one, and three orders of magnitude higher than that for pure XG revealing a transition from insulating to conductive properties. The results demonstrated that XG/MnO <sub>2</sub> nanocomposite membranes are promising for potential applications in NO <sub>2</sub> gas sensing.		
Waterborne nano-emulsions of polyvinyl acetate-polyurethane coatings containing different types of vinyl monomers: synthesis and characterization	Coatings		This paper aims to synthesize new terpolymers by the emulsion polymerization technique composed of acrylamide-based polyurethane monomers (TPM and MPM) with different vinyl acetate copolymer systems, such as vinyl acetate/butyl acrylate (VAc/BA), vinyl acetate/ethylhexyl acrylate (VAc/2-EHA) and vinyl acetate/vinyl ester of versatic acid (VAc/VEOVA 10) systems. The performance of the prepared terpolymers as binders in emulsion coatings and textile industries was investigated and compared with the analogous commercial ones. New waterborne polyurethane-vinyl ester-vinyl acetate terpolymers with high solid content and nano-scale	2023	<a href="https://doi.org/10.1108/PRT-06-2021-0063">https://doi.org/10.1108/PRT-06-2021-0063</a>

emulsions have been successfully synthesized in two steps. The polyurethane oligomers were prepared by the prepolymer method as the first step. The second step involved polymerization with different vinyl monomers. The synthesized terpolymers were characterized using FTIR, scanning electron microscope, thermogravimetric analysis, minimum film forming temperature and particle size analyzer methods. The synthesized emulsion terpolymers have shown small particle sizes averaged of 70 nm and a narrow distribution range, along with good mechanical, thermal and chemical stabilities. The surface coating layers of the terpolymers also have some important in terms of smoothness, clarity and binding ability in water-based coating for up to 4425 scrub cycles at 30 GU. Further, a high potential application textile printing was achieved at high solid content of 47–50%. The effects of different isocyanates and vinyl monomers on the properties of obtained emulsion coatings have been studied. The

		improvement consequences of the coating evaluation of the waterborne binders for emulsion paints have been described. The properties of polyester/cotton fabric print pigment printing of textiles appear to be most promising enhancements by using the prepared nanocomposites of PU-co-vinyl acetate-co-vinyl ester as waterborne binders. So that the prepared emulsions have the potential to replace solvent-based coatings as waterborne binders for both emulsion coating and textile printing applications.		
Graphene Oxide/Polyvinyl Alcohol-Formaldehyde Composite Loaded by Pb Ions: Structure and Electrochemical Performance	Material Science	An immobilization of graphene oxide (GO) into a matrix of polyvinyl formaldehyde (PVF) foam as an eco-friendly, low cost, superior, and easily recovered sorbent of Pb ions from an aqueous solution is described. The relationships between the structure and electrochemical properties of PVF/GO composite with implanted Pb ions are discussed for the first time. The number of alcohol groups decreased by 41% and 63% for PVF/GO and the PVF/GO/Pb composite, respectively, compared	2022	<a href="https://doi.org/10.3390/polym14112303">https://doi.org/10.3390/polym14112303</a>

		to pure PVF. This means that chemical bonds are formed between the Pb ions and the PVF/GO composite based on the OH groups. This bond formation causes an increase in the Tg values attributed to the formation of a strong surface complexation between adjacent layers of PVF/GO composite. The conductivity increases by about 2.8 orders of magnitude compared to the values of the PVF/GO/Pb composite compared to the PVF. This means the presence of Pb ions is the main factor for enhancing the conductivity where the conduction mechanism is changed from ionic for PVF to electronic conduction for PVF/GO and PVF/GO/Pb.		
Degradation of local Brilliant Blue R dye in presence of polyvinylidene fluoride/MWCNTs/TiO <sub>2</sub> as photocatalysts and plasma discharge	Water treatment	The need of clean water and the water-poor are increasing daily in the world. In addition, we are facing a dramatic increase in the industrial pollutions of rivers and groundwater, which led us to find a new way to treat industrial pollutants. The <a href="#">plasma discharge</a> technique is one of the important, safe, and applicable for <a href="#">industrial wastewater decontamination</a> . Decolorization of Brilliant Blue R	2022	<a href="https://doi.org/10.1016/j.jece.2021.106854">https://doi.org/10.1016/j.jece.2021.106854</a>

		<p>(BBR) dye as a hazard material was noticed when the contaminated solution was exposed to the plasma discharge technique. The combination between the nonthermal plasma and catalysts was evaluated in this work to optimize the degradation efficiency. The PVDF/(MWCNTs/TiO<sub>2</sub>) as three system composites was employed to enhance the nonthermal plasma performance. The surface area, phase purity, shape, and <a href="#">photonic</a> efficiency were characterized employing XRD, FTIR, <a href="#">SEM</a>, <a href="#">DSC</a>, and UV-Vis. techniques. The obtained results of degradation using NTP technique in presence of the PVDF/MWCNTs catalyst have been enhanced the BBR dye degradation by 19% than only plasma treatment for 20 min. The durability processes of prepared PVDF/(MWCNTs/TiO<sub>2</sub>) was investigated and evaluated until 8 solar photocatalytic process repeating times.</p>		
Impact of Starch Coating Embedded with Silver Nanoparticles on Strawberry Storage Time	Coatings	The strawberry has a very short postharvest life due to its fast softening and decomposition. The goal of this research is to see how	2022	<a href="https://doi.org/10.3390/polym14071439">https://doi.org/10.3390/polym14071439</a>

well a starch-silver nanoparticle (St-AgNPs) coating affects the physical, chemical, and microbiological qualities of strawberries during postharvest life. Additionally, the effect of washing with running water on silver concentration in coated strawberry fruit was studied by an inductively coupled plasma-optical emission spectrometer (ICP-OES). Furthermore, the shelf-life period was calculated in relation to the temperature of storage. Fourier transform infrared-attenuated total reflectance (FTIR-ATR), UV-Visible, and Transmission Electron Microscopic (TEM) were used to investigate the structure of starch-silver materials, the size and shape of AgNPs, respectively. The AgNPs were spherical, with an average size range of 12.7 nm. The coated samples had the lowest weight loss, decay, and microbial counts as compared to the uncoated sample. They had higher total acidity and anthocyanin contents as well. The washing process led to the almost complete removal of silver particles by rates ranging from 98.86 to 99.10%. Finally, the coating

			maintained strawberry qualities and lengthened their shelf-life from 2 to 6 days at room storage and from 8 to 16 days in cold storage.		
	Effect of Chitosan Nanoparticles as Edible Coating on the Storability and Quality of Apricot Fruits	Nanotechnology	Apricots are a fragile fruit that rots quickly after harvest. Therefore, they have a short shelf-life. The purpose of this work is to determine the effect of coatings containing chitosan (CH) as well as its nanoparticles (CHNPs) as thin films on the quality and shelf-life of apricots stored at room ( $25 \pm 3$ °C) and cold ( $5 \pm 1$ °C) temperatures. The physical, chemical, and sensorial changes that occurred during storage were assessed, and the shelf-life was estimated. Transmission electron microscopy was used to examine the size and shape of the nanoparticle. The nanoparticles had a spherical shape with an average diameter of 16.4 nm. During the storage of the apricots, those treated with CHNPs showed an obvious decrease in weight loss, decay percent, total soluble solids, and lipid peroxidation, whereas total acidity, ascorbic acid, and carotenoid content were higher than those in the fruits treated with CH	2022	<a href="https://doi.org/10.3390/polym14112227">https://doi.org/10.3390/polym14112227</a>

		and the untreated fruits (control). The findings of the sensory evaluation revealed a significant difference in the overall acceptability scores between the samples treated with CHNPs and the other samples. Finally, it was found that CHNP coatings improved the qualitative features of the apricots and extended their shelf-life for up to 9 days at room temperature storage and for 30 days in cold storage.		
Photo-curable carboxymethylcellulose composite hydrogel as a promising biomaterial for biomedical applications	Polymer for biomedical applications	A series of carboxymethylcellulose (CMC) functionalized with glycidyl methacrylate (GMA) was successfully synthesized for producing of CMC-g-GMA copolymer. Water-soluble CMC-g-GMA copolymer was photo-crosslinked while Irgacure-2959 was used as a UV-photo-initiator at 365 nm. On the other hand, <a href="#">cellulose nanocrystals</a> (CNCs) from sugarcane were graft-copolymerized in an aqueous solution utilizing cerium ammonium nitrate (CAN) as an initiator in a redox-initiated free-radical approach. CNCs were grafted with GMA to enhance their physicochemical and biological	2022	<a href="https://doi.org/10.1016/j.ijbiomac.2022.03.201">https://doi.org/10.1016/j.ijbiomac.2022.03.201</a>

		characteristics. Factors affecting hydrogel formation, <i>e.g.</i> CMC-g-GMA copolymer concentration, irradiation time and incorporation of different concentration of CNCs-g-GMA nano-filler, were discussed in dependance on the swelling degree and gel fraction of the produced hydrogels. Notably, the addition of CNCs-g-GMA nanofillers increased progressively <a href="#">thermal stability</a> of the prepared hydrogel. CMC-g-GMA filled with CNCs-g-GMA composite hydrogel showed <a href="#">antimicrobial activity</a> against <a href="#">multidrug resistance</a> pathogens. Thus, CMC-g-GMA filled with CNCs-g-GMA composite hydrogel could be endorsed as compatible biomaterials for versatile biomedical applications.		
Structure of plasma-deposited copolymer films prepared from acrylic acid and styrene: Part III sulfonation and electrochemical properties	Polymer for Fuel cells applications	Acrylic acid-styrene copolymer films were deposited plasma-chemically more gently using the pulsed plasma mode instead of the continuous mode, with linear and some slightly branched chains and marginal crosslinking. Then, the styrene unit of copolymers was wet-chemically sulfonated by chlorosulfuric acid. On exposure to	2022	<a href="https://doi.org/10.1002/ppap.202100222">https://doi.org/10.1002/ppap.202100222</a>

		air, the formed 4-chlorosulfonic acid groups hydrolyze to sulfonic acid groups ( $-\text{SO}_3\text{H}$ ). Fourier transform infrared spectroscopy, X-ray photoelectron spectroscopy, and broadband dielectric spectroscopy were employed to characterize the composition, structure, functional groups, and electrochemical performance of the copolymers. A high concentration of sulfonic acid-containing groups was obtained in the sulfonated polystyrene sample. The values of the DC conductivity $\sigma_{\text{DC}}$ for the sulfonated sample of the acrylic acid and styrene copolymer are ca. five orders of magnitude higher than that of the not-sulfonated copolymer materials.		
Synthesis and Characterization of Nylon 6,6-Polyvinyl Alcohol-Based Polyelectrolytic Membrane	Polymer for Fuel cells	This work presents the preparation and investigation of blended nylon (N)/polyvinyl alcohol (PVA)-based polyelectrolytic membranes that are modified with different concentrations of sulfuric acid (SA), chlorosulfonic acid (CSA), and sulfonated activated carbon (SAC) as a filler. Scanning electron microscopy (SEM) micrographs illustrated good membrane homogeneity, and no cracks or phase	2022	<a href="https://doi.org/10.1007/s13369-022-07537-3">https://doi.org/10.1007/s13369-022-07537-3</a>

		separation were detected. Chemical interaction between N, PVA, and other membrane components was confirmed by Raman scattering spectroscopy and Fourier transform infrared (FTIR). In addition, the molecular structure is verified by energy depressive X-ray (EDX). Furthermore, water and methanol uptake, gel fraction, and IEC were determined as functions of varied membrane modification components. The results revealed that increasing the portion of SA, CSA and SAC led to an increase in IEC and ionic conductivity values reached 2.12 meq/g–0.076 S/cm for (N/PVA-4.0% SA-4.0% SAC), respectively, and 2.71 meq/g–0.087 S/cm for (N/PVA-4.0% CSA-4.0% SAC), respectively, while the IEC and ionic conductivity value for non-modified N/PVA membrane was 0.02 meq/g and zero, respectively. Such results enhance the potential feasibility of modified N/PVA electrolytic membranes for fuel cell (FC) applications.		
Influence of pH values on the electrochemical performance of	Corrosion and plasma Chemistry	Chromium (VI) coatings are highly toxic and <a href="#">carcinogenic</a> ; therefore, thea should be replaced by a new	2021	<a href="https://doi.org/10.1016/j.arabjc.2021.103391">https://doi.org/10.1016/j.arabjc.2021.103391</a>

<p>low carbon steel coated by plasma thin <math>\text{SiO}_x\text{C}_y</math> films</p>		<p>eco-friendly material that retains its effectiveness in terms of corrosion. Herein, thin <a href="#">silicon</a> oxycarbide films as an eco-friendly anticorrosive coating were deposited on a low carbon steel substrate by a radio frequency capacitively coupled plasma technique using <a href="#">tetraethyl orthosilicate</a> (TEOS) as a precursor. The corrosion performance of the coatings were evaluated by potentiodynamic polarization and <a href="#">electrochemical impedance spectroscopy</a> (EIS) in dependence on the gap distance between the plasma electrodes and the pH values at <a href="#">room temperature</a>. The chemical bonding and morphological features of the deposited films were investigated by Fourier Transformer <a href="#">Infrared Spectroscopy</a> in Attenuated Total Reflectance (ATR-FTIR) mode, X-Ray Diffraction (XRD), and energy-dispersive X-ray spectroscopy (EDX) coupled with scanning electron microscopy (SEM). The <math>E_{\text{corr}}</math> values were significantly decreased by reducing the gap distance and reached a minimum at 1 cm gap distance. It was reduced</p>		
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			from 12 $\mu\text{A}/\text{cm}^2$ for the blank sample to 0.714 $\mu\text{A}/\text{cm}^2$ in treated sample at gap distance 1 cm and protective efficiency reached ~ 94% in the neutral solution. Nevertheless, the best protective efficiency achieved more than 99% of the total protection in alkaline medium as measured at room temperature for treated sample at gap distance 1 cm.		
	Recycling of supported nanocomposites for hazardous industrial wastewater treatment via Solar photocatalytic process	Water treatment	Study of the photocatalytic activity of the synthesized polyvinylidene fluoride/multi-walled carbon nanotubes/titanium dioxide (PVDF/x%(MWCNTs/8%TiO <sub>2</sub> ) nanocomposites using a simple modified solvent casting technique in decontamination of hazardous industrial wastewater and Reactive Yellow 145 dye as an industrial organic pollutant (local textile dye) were evaluated. Also, different MWCNTs/8%TiO <sub>2</sub> weight percentages in PVDF/x%(MWCNTs/8%TiO <sub>2</sub> ) nanocomposites were prepared and evaluated. The surface morphology and the structures of the synthesized samples were characterized using SEM, ATR-FTIR, DRS, XRD, and BET. The evaluated bandgap values	2021	<a href="https://doi.org/10.1016/j.ejpe.2021.02.001">https://doi.org/10.1016/j.ejpe.2021.02.001</a>

for MWCNTs/xTiO<sub>2</sub> nanocomposites are from 2.38 to 2.69 based on the weight ratios (2%, 5%, and 8%). The results of the surface area of samples and the best optical behavior obtained at MWCNTs/8%TiO<sub>2</sub> are reported and its photodegradation rate raised to  $10.22 \times 10^{-3} \text{S}^{-1}$ . The photodegradation process of Reactive Yellow 145 dye by PVDF/x%(MWCNTs/8%TiO<sub>2</sub>) nanocomposites was monitoring using chemical oxygen demand (COD). Also, the observed PL intensity for PVDF/MWCNTs/8%TiO<sub>2</sub> has high photonic efficiency and photocatalytic activity. The solar photocatalytic process efficiency for an Egyptian dying factory by repeating it 10 times using PVDF/10%(MWCNTs/8%TiO<sub>2</sub>) nanocomposites as a supported photocatalyst for the industrial wastewater treatment was evaluated by the COD method and still under Egyptian environmental law allowed COD limit (1000 ppm).

<p>One-step plasma deposited thin <math>\text{SiO}_x\text{C}_y</math> films for corrosion resistance of low carbon steel</p>	<p>Corrosion and plasma chemistry</p>	<p>Tetraethyl orthosilicate (TEOS) was used as a chemical precursor to deposit ultra-thin <math>\text{SiO}_x\text{C}_y</math> plasma polymer films onto mild steel surfaces for preventing the corrosion process. The structure–property relationships of the coatings were evaluated by X-ray Photo Spectroscopy (XPS), X-Ray Diffraction (XRD), Fourier Transform InfraRed spectroscopy (ATR-FTIR) and Energy Dispersive X-ray spectroscopy (EDX) completed with Scanning Electron Microscopy (SEM). The SEM micrographs confirmed a pinhole-free surface morphology of the low-pressure deposited plasma polymer films. The TEOS molecules become fragmented in the plasma by numerous collisions with energy-rich electrons and heavier particles. Recombination of fragments and condensation onto the steel substrate is responsible for the formation of organic <math>\text{SiO}</math> containing plasma polymer layers. Such thin layers consist of predominantly <math>\text{SiO}_x</math> structures. Their properties are determined largely by the gap distance between the two samples</p>	<p>2021</p>	<p><a href="https://doi.org/10.1080/01694243.2020.1856539">https://doi.org/10.1080/01694243.2020.1856539</a></p>
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			used as electrodes in the plasma. The efficiency of the corrosion-protecting coating was compared with uncoated samples. The corrosion protection was determined by exposure of samples to 3.5% NaCl aqueous solutions. For this purpose, polarization and Electrochemical Impedance Spectroscopy (EIS) were used to monitor the corrosion. The optimal gap distance between the electrodes was determined for corrosion protection. The best protective efficiency reached more than 97% of the total protection as measured at room temperature.		
	Novel PVA/Methoxytrimethylsilane elastic composite membranes: preparation, characterization and DFT computation	Material Science	A modified composite membranes (PVA/SiOH/SiOC) were made via solution-casting process using different 1:1, 1:2, 1:3 and 1:4 volume ratios of polyvinyl alcohol (PVA):methoxytrimethylsilane (MTMS). Moreover, FT-infrared and energy-dispersive X-ray spectroscopy (EDX) were measured to account for the network structural rearrangements involving silicon within PVA matrices. The addition of MTMS has improved the thermal and mechanical properties of the	2021	<a href="https://doi.org/10.1016/j.molstruc.2021.130173">https://doi.org/10.1016/j.molstruc.2021.130173</a>

composite membranes as compared to pristine PVA. In addition, the crystallinity and the morphological changes of PVA/MTMS composites was studied using X-ray diffraction (XRD) and scanning electron microscope (SEM), respectively. Three structures were suggested based on trimethyl silanol (I) wet out condensation (II and III) with the dopped PVA followed by and H-bonding interactions (IV). The outcomes of B3LYP/6-31G(d) frequency calculations favors a three-dimensional SiOC linked network (III). Nevertheless, EDX reveals, the 3D SiOC links are not observed on the surface of composite membranes, however, is found dominant in the bulk,  $[(CH_3)_3SiOCH_2CH_2CH_2O]_n$ . Moreover, the solubility, density, and refractive index of the synthesized composites were measured and found depended on the ratio of PVA in the composite membranes. The current results are compared with that published earlier including dimethoxydimethylsilane at the same conditions.

<p>Modified polyvinyl chloride membrane grafted with an ultra-thin polystyrene film: structure and electrochemical properties</p>	<p>Polymer for Fuel Cells applications</p>	<p>The work explores the synthesis and the properties of a novel <a href="#">composite membrane</a> system based on modified <a href="#">polystyrene</a> (PS) grafted onto a <a href="#">polyvinyl chloride</a> (PVC) membrane. PVC membranes were prepared by solution-casting followed by exposure to an atmospheric pressure <a href="#">dielectric</a> barrier discharge (DBD) with O<sub>2</sub> to obtain an activated surface for grafting PS to it. Moreover, the thus prepared membranes were chemically modified furthermore by amination with <a href="#">polyethyleneimine</a> or sulfonation with 4 M sulfuric acid. The membrane surface characteristics such as <a href="#">wettability</a>, structure and morphology were investigated using water contact angle measurements, attenuated total reflection <a href="#">Fourier transform infrared spectroscopy</a> and scanning electron microscopy experiments. The thermogravimetric stability and electrolytic responses of the membranes were studied utilizing <a href="#">TGA</a>, ion exchange capacity (IEC), and solvent uptake. A significant result of plasma and</p>	<p>2021</p>	<p><a href="https://doi.org/10.1016/j.jmrt.2021.04.018">https://doi.org/10.1016/j.jmrt.2021.04.018</a></p>
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		chemical modification was to produce a membrane material with low permeability. Thus, the methanol permeability of the sulfonated membranes measured for 12 h was measured to $2.34 \cdot 10^{-8} \text{ cm}^2 \text{ s}^{-1}$ compared to $177.00 \cdot 10^{-8} \text{ cm}^2 \text{ s}^{-1}$ of Nafion 117® which is considered as a benchmark. This result indicates that the prepared sulfonated samples are an innovative and effective material for decreasing the methanol crossover in fuel cells to a great extent. This makes the PVC-g-St membranes are promising and attractive as new materials for <a href="#">polyelectrolyte</a> membrane for fuel cells.		
Cellulose nanocrystals from sugarcane bagasse and its graft with GMA: Synthesis, characterization, and biocompatibility assessment	Polymer for biomedical applications	This work presents the preparation of cellulose nanocrystals (CNCs) from sugarcane bagasse via acid hydrolysis of bleached pulp. Crystallinity and size of CNCs were characterized by XRD and zetasizer at 77% and 260 nm, respectively. CNCs were graft copolymerized in an aqueous suspension by a redox-initiated free radical method using cerium ammonium nitrate (CAN) as the initiator. Glycidyl methacrylate	2021	<a href="https://doi.org/10.7324/JAPS.2021.110215">10.7324/JAPS.2021.110215</a>

(GMA) was grafted onto CNCs to improve its physicochemical properties and biological activity. The parameters affecting the grafting of CNCs-g-GMA, e.g., GMA and CAN concentrations and grafting time were studied. The results revealed that high grafting yield (~180%) was obtained by increasing GMA and middle concentration of the CAN initiator (2 mmol/g). The grafting yield (%) of CNCs-g-GMA for all grafting conditions was calculated gravimetrically, while CNCs-g-GMA was characterized by FTIR, scanning electron microscope, and thermal gravimetric analysis analyses. Antimicrobial activity of CNCs and CNCs-g-GMA was assessed *in vitro* against human Gram +ve and -ve bacteria and against *Candida albicans* fungus. 2.5 g l<sup>-1</sup> of CNCs-g-GMA copolymer showed the highest antimicrobial activity, due to its significant ability to kill ~80% of *Staphylococcus aureus*, 71.4% of *Salmonella typhimurium*, and 70% of *Klebsiella pneumonia*. Also, CNCs and CNCs-g-GMA exhibited clinically

			accepted cell viability (%) with almost 90%–100% versus HDF and WI38 human normal cell lines.		
	Porous Polyvinyl Formaldehyde / MWCNTs Foam for Pb+2 Removal from Water	Water treatment	Preparation of macro-porous polyvinyl formaldehyde / multi-walled carbon nanotubes (PVF/MWCNTs) foam was done via one step reaction during acetalization of polyvinyl alcohol (PVA). The as-prepared PVF/MWCNTs composite was used as an eco-friendly, easy recovery sorbets for Pb (II) from aqueous medium. Fourier transform infrared (FTIR), and high-resolution scanning electron microscopy (HRSEM) were used to investigate the chemical composition and morphological structure of the prepared foam. The results showed that equilibrium occurred within 60 min at $\text{pH} \approx 5$ with a maximum adsorption capacity 3.4 mg/g with 43 % removal (considering the total weight of composite). In addition, the kinetic results are most fitted with pseudo-second-order model indicating that the reaction mechanism is chemisorption in nature. Therefore, it is suggested that the prepared PVF/MWCNTs foam	2021	<a href="https://doi.org/10.21608/ejchem.2020.34453.2733">10.21608/ejchem.2020.34453.2733</a>

			can be used in water treatment systems as an eco-friendly and efficiency sorbent.		
	Development of biodegradable poly (vinyl alcohol) /chitosan cross linked membranes for antibacterial wound dressing applications	Polymer for biomedical applications	In this study, poly vinyl alcohol/chitosan (PVA/Cs) membranes were developed via surface crosslinking technique for advanced wound dressing applications. Fourier Transform Infrared Spectrophotometer (FT-IR) and Scanning Electron Microscope (SEM) analysis tools were conducted to illustrate the chemical structures and the morphological changes of the developed membranes. Moreover, the mechanical analysis also investigated using tensile testing machine. The obtained results showed that PVA/Cs cross linked membrane recorded maximum force of 46.2 N compared with 26.09 N for Cs, indicating that the crosslinking process improved the developed membrane. Besides, the hydrophilic character of the developed membranes was examined using water uptake studies and decreased from 187% and 142% recorded by native Cs and PVA, respectively to 115% for the cross linked	2021	<a href="http://jibs.hu.edu.jo/files/vol14/n1/old/Binder14n1old.pdf">jibs.hu.edu.jo/files/vol14/n1/old/Binder14n1old.pdf</a> #pag

		membrane. Two different types of bacteria were used for studying the anti-bacterial activities of the developed cross linked membranes, namely gram-positive bacteria (Staphylococcus aureus) and gram-negative bacteria (Escherichia coli). The anti-bacterial activity of the developed cross linked membranes was augmented compared with native PVA and Cs membranes as the maximum inhibition (%) value increased from 10 and 12% to 22 and 30% after crosslinking. Besides, the cross linked membranes exhibited better bio-degradability; moreover, the mechanical strength of the cross linked membranes showed good mechanical stability. The findings suggest that the cross linked PVA/Cs membranes could be efficiently applied as anti-bacterial and bio-degradable dressers for accelerating the wound healing process.		
Degradation of organic dye using plasma discharge: optimization, pH and energy	Water treatment	Decolorization of Acid Orange 142 (AO142) as important water pollutant was observed on the exposure of the dye solutions to an atmospheric non-thermal gas plasma. A response surface methodology (RSM) combined with	2020	<a href="#">Degradation of organic dye using plasma discharge: optimization, pH and energy - IOPscience</a>

		<p>a central composite design (CCD) was utilized to optimize the main factors (variables) affecting the degradation efficiency (response) of AO142, such as the applied voltage, the gap distance between the high voltage electrode and the surface of the solution. The regression analysis showed that a first-order polynomial model well fits the experimental data with a coefficient of determination <math>R^2 = 0.96</math>. FT-IR, UV-vis, TOC and GC-MS measurements were used to investigate the decolorization of the dye on exposure to the plasma discharges. A possible degradation pathway was postulated. Additionally, the conductivity and pH changes during the treatment were also evaluated. The plasma treatment combined with <math>Fe^{2+}</math> (plasma Fenton reaction) exhibited a higher degradation efficiency, higher energy yield connected with lower energy consumption in comparison to the plasma treatment without <math>Fe^{2+}</math> addition.</p>		
Structure/property relationship of polyvinyl alcohol/dimethoxydimethylsilane	Material Science	A novel mixed matrix composite has been prepared using solution-casting method at different volume	2020	<a href="https://doi.org/10.1016/j.saa.2019.117810">https://doi.org/10.1016/j.saa.2019.117810</a>

<p>composite membrane: Experimental and theoretical studies</p>		<p>concentrations of polyvinyl alcohol; PVA (50, 67, 75 and 80%) and fixed amount of dimethoxydimethylsilane in air atmosphere. The hydrolyzed dimethyldisilanol acts as in-situ cross linker through a wet-out <a href="#">condensation</a> between the <a href="#">hydroxyl</a> moieties of <math>\text{SiOH}</math> and <math>\text{PVAOH}</math>. Such process improves the mechanical properties of composite membranes as compared to pristine PVA which has been determined as function of varied membrane components to evaluate the structure/property relationships. Furthermore, DFT (B3LYP)/6-31G(d) geometry and frequency computations were carried out for the suggested dimeric PVA structures via 1,3-diol linkage followed by condensation and <a href="#">hydrogen bonding</a> interaction. Vibrational interpretations of composite membranes were proposed based on the computed wavenumbers, Cartesian coordinates displacements for the suggested hydrolyzed products involving the dominant <math>\text{PVA/SiOH/SiOC/SiOSi}</math> functional groups compared with those given in</p>		
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		literatures. FTIR and EDX provide clear evidences for incorporating <a href="#">silicon</a> to 3D network. Meanwhile, the infrared de-convoluted spectral interpretations ensure 17–30% cross-linked SiOC within the network of composite membranes.		
High performance graphene-based PVF foam for lead removal from water	Water treatment	The synthesis and optimization of superior and eco-friendly <a href="#">sorbents</a> for Pb(II) pose a great challenge in the field of water treatment. The sorbent was developed by introducing <a href="#">graphene oxide</a> (GO) into the matrix of polyvinyl formaldehyde (PVF) foam. The immobilization of GO in PVF results in significant increase in the maximum adsorption capacity (Qt) of GO powder for Pb(II), from $\approx 800$ to $\approx 1730 \text{ mg g}^{-1}$ in the case of GO/PVF foam. As compared with GO powder in Pb(II) aqueous solutions, PVF matrix keeps GO sheets stable without any agglomeration. The large surface area of GO sheet allows the abundant oxygenated functional groups on its surface to participate effectively in the Pb(II) <a href="#">adsorption process</a> , leading to the huge increase		<a href="https://doi.org/10.1016/j.jmrt.2020.08.011">https://doi.org/10.1016/j.jmrt.2020.08.011</a>

			of the Qt. <a href="#">Adsorption isotherms</a> and kinetic studies indicated that the sorption process of Pb(II) on GO/PVF was done on heterogenous surface by ion-exchange reaction. The GO/PVF foam showed an excellent reusability for more than 10 cycles with almost the same efficiency and without any significant change in its physical properties.		
	Effect of Silver Nanoparticles on the Dielectric Properties and the Homogeneity of Plasma Poly(acrylic acid) Thin Films	Material Science	For the first time, structure–electrochemical relationships of thin films of a plasma-polymerized acrylic acid/carbon dioxide AA/CO <sub>2</sub> (75/25%) copolymer modified by implanted silver nanoparticles are discussed. The pulsed plasma polymerization of AA/CO <sub>2</sub> was utilized and adjusted to obtain a maximal amount of COOH groups forming an almost uncross-linked polymer structure. The prepared polymer layer is rinsed by a silver nitrate solution to impregnate Ag <sup>+</sup> ions. This step is followed by its reduction of Ag <sup>+</sup> with NaBH <sub>4</sub> as a chemical route in comparison to the reduction by sunlight as an ecofriendly photoreduction method. The	2020	<a href="https://doi.org/10.1021/acs.jpcc.0c06712">https://doi.org/10.1021/acs.jpcc.0c06712</a>

		chemical composition and morphology of the topmost surface layer of the AA/CO <sub>2</sub> polymer thin film were investigated by X-ray photoelectron spectroscopy and atomic force microscopy. Moreover, the molecular mobility, conductivity, and thermal stability of the polymer layer were analyzed using broadband dielectric spectroscopy. The dielectric properties of the AA/CO <sub>2</sub> polymer thin film were studied in the presence of Ag <sup>+</sup> ions or Ag <sup>0</sup> . It was found that a cross-linked polymer layer with a smooth surface and high conductivity was obtained in the presence of Ag <sup>+</sup> / Ag <sup>0</sup> .		
Assessment of vinyl acetate polyurethane-based graft terpolymers for emulsion coatings: Synthesis and characterization	Coatings	Hybrid oligomers composed of polyurethane methacrylate (PUMA) and polyurethane acrylate (PUA) were synthesized by poly addition polymerization of polypropylene glycol (PPG 1000), 2,4- and 2,6-toluen diisocyanate (TDI 80/20) and 2-hydroxyethyl methacrylate or 2-hydroxyethyl acrylate. Isopropanol was served as the isocyanate blocking agent. The grafting of either PUMA or PUA oligomers to the vinyl acetate monomer was	2020	<a href="https://doi.org/10.1080/10601325.2019.1691448">https://doi.org/10.1080/10601325.2019.1691448</a>



implemented for the first time for improving the properties of the produced PU-co-VAc or (PUP<sub>MA</sub> or PUP<sub>A</sub>) terpolymers as new binders for emulsion coating formulations. The synthesized terpolymers were characterized with Fourier-transform infrared spectroscopy (FTIR), proton nuclear magnetic resonance (<sup>1</sup>H NMR), scanning electron microscope (SEM), gel permeation chromatography (GPC), minimum film forming temperature (MFFT), thermal gravimetric analysis (TGA), Zeta potential and mechanical properties. It has been shown that properties of the terpolymers and their corresponding films were greatly influenced by the grafting of PUMA and PUA at a low concentration level (5 wt%). Cured films of PU based vinyl acetate (PUP<sub>MA</sub> or PUP<sub>A</sub>) exhibited higher thermal stability and less weight loss compared to the vinyl acetate copolymer (PVAC). The synthesized PUP<sub>MA</sub> and PUP<sub>A</sub> terpolymers revealed enhanced efficiency as binders for emulsion paints in comparison to the PVAC copolymer.

			The terpolymers composed of poly (vinyl acetate-co-butyl acrylate-co-PU) emulsions have excellent properties and high enhancements in emulsion paints as waterborne binders.		
	PLASMA POWER IMPACT ON ELECTROCHEMICAL PERFORMANCE OF LOW CARBON STEEL COATED BY PLASMA THIN TEOS FILMS	Corrosion	Electrochemical properties of thin silicon oxy carbide films were investigated as anticorrosive coatings. The film was deposited on low carbon steel substrate by radio frequency capacitive coupled plasma technique using tetraethyl ortho silicate (TEOS) as a precursor and Ar was used as a carrier gas in dependence on the applied power. The chemical composition and morphological of the deposited films were examined by energy-dispersive X-ray spectroscopy (EDX) coupled with scanning electron microscopy (SEM). The SEM results confirm a pinhole-free layer of oxy carbide was formed on the steel surface after plasma treatment. The corrosion resistance of the coatings was analyzed by potentiodynamic polarization and electrochemical spectroscopy (EIS) in 3.5% NaCl solution at room temperature. The	2020	<a href="https://doi.org/10.21608/absb.2020.111474">10.21608/absb.2020.111474</a>

		electrochemical results show remarkable corrosion resistance enhancement after plasma treatments. The corrosion current ( $i_{corr}$ ) is significantly reduced from $12 \mu A/cm^2$ for the blank sample to 1 and $0.3 \mu A/cm^2$ for treated samples at 50, and 100 W, respectively. A marked increase of the protective properties was detected by 100 W sample with protective efficiency more than 98 % at room temperature.		
A New Route for Synthesis of Polyurethanevinyl Acetate Acrylate Emulsions as Binders for Pigment Printing of Cotton Fabrics	Coatings	HEREIN, two polyurethane oligomers were successfully synthesized using a prepolymer mixing process. The prepolymers were synthesized based on the step-growth addition polymerization of polypropylene glycol, Methylene diphenyl diisocyanate and 2-hydroxyethyl methacrylate or 2-hydroxyethyl acrylate. Isopropanol was functioned as the isocyanate blocking agent. Thereafter, different terpolymer emulsions were prepared by the emulsion graft copolymerization with the vinyl acetate monomer in presence of 2-ethylhexyl acrylate as a vinyl monomer. The chemical structures of the synthesized oligomeric	2020	<a href="https://doi.org/10.21608/ejchem.2020.21712.2292">10.21608/ejchem.2020.21712.2292</a>

		monomers were probed by FTIR spectroscopy and found to vary with the content of acrylic monomer used in the oligomer synthesis phase (i.e. hydroxyethyl acrylate or hydroxyethyl methacrylate). The topography, thermal stability, and particle size of terpolymers were investigated by SEM, TGA, and zeta potential, respectively. The TGA results demonstrated marked enhancement in thermal stability of the synthesized terpolymers up to ca. 600°C, which was concurrent with enhanced surface homogeneity and film properties as evidenced by the SEM images. These terpolymers showed also property enhancement as binders for textile pigment printing in terms of rubbing resistance, color strength and fastness to washing when compared to the commercial binders. These judgments would provide a new competent synthesis route by introducing polyurethane acetate vinyl acrylate as the binder for use in pigment printing of cotton fabrics.		
Synergistic Effect between Natural Honey and 0.1 M KI as	Corrosion	The inhibition process of steel against corrosion in 1.0 M HCl using natural honey in the presence and	2019	<a href="https://doi.org/10.1515/zpch-2018-1208">https://doi.org/10.1515/zpch-2018-1208</a>

	Green Corrosion Inhibitor for Steel in Acid Medium		absence of 0.1 M KI was studied at 25–55 °C utilizing a potentiodynamic polarization, electrochemical impedance spectroscopy (EIS) measurements and gravimetric method. Corresponding surfaces of steel were examined by SEM and EDX techniques. The obtained data demonstrated that inhibition efficiency increased by increasing both natural honey dose and environment temperature. Synergism parameter values were found more than one indicating that the inhibition efficiency of natural honey enhanced by an addition of KI due to synergism. The adsorption of natural honey in the presence and absence of iodide ions on the steel surface was found to follow Langmuir adsorption isotherm.		
	Enhancement of Poly(vinyl chloride) Electrolyte Membrane by Its Exposure to an Atmospheric Dielectric Barrier Discharge Followed by Grafting with Polyacrylic Acid	Fuel cells	A poly(vinyl chloride) (PVC) membrane was exposed to atmospheric-pressure dielectric barrier discharge and subsequently wet-chemically grafted with poly(acrylic acid) (PAA) and then consumed with poly(ethyleneimine) (PEI). The thus modified membrane was characterized by measurement	2019	<a href="https://doi.org/10.1007/s11090-019-10017-6">https://doi.org/10.1007/s11090-019-10017-6</a>

		<p>of the static water contact angle, by scanning electron microscopy, infrared spectroscopy (ATR-FTIR), thermogravimetry (TGA) and electrolytic responses. The TGA favors a thermally stable grafted PVC membrane. The ATR-FTIR revealed the existence of an ultra-thin PAA layer grafted onto the surface of the plasma-modified PVC membrane. The ion exchange capacity measurement of the grafted poly(vinyl chloride) (PVC-PAA) sample was close to that of additionally wet-chemically aminated with PEI for 12 h or more (PVC-PAA-PEI). It means that PVC-PAA membranes do not need necessarily further modifications. As concomitant helpful effect, it was observed that the swelling degree of the PVC membrane was reduced after plasma exposure due to plasma-induced crosslinking.</p>		
Surface modification of polyvinyl chloride by polyacrylic acid grafts a polyelectrolyte membrane using Ar plasma	Fuel cells	<p>This work reports the synthesis and properties of a new membrane based on polyvinyl chloride (PVC) grafting with polyacrylic acid (PAA) using argon (Ar) plasma. The membranes of PVC were synthesized by solution-casting</p>	2019	<a href="https://doi.org/10.3906/kim-1903-48">https://doi.org/10.3906/kim-1903-48</a>

		method, where PAA was deposited as an ultrathin film onto PVC using dielectric barrier discharge at atmospheric pressure with Ar gas. The surface characteristics and chemical composition of the modified membranes were analyzed by water contact angle, scanning electron microscopy, and Fourier transform infrared spectroscopy. Moreover, the electrochemical properties of the membrane were investigated via ion exchange capacity for the purpose of using it as a polyelectrolyte membrane.		
Plasma O <sub>2</sub> modifies the structure of synthetic zeolite-A to improve the removal of cadmium ions from aqueous solutions	Water treatment	The present study addresses the removal of cadmium ions (Cd(II)) from aqueous solutions at a pH of 7.5 using zeolite-A activated by exposure to oxygen plasma. The activation process was performed over a wide range of plasma powers (10, 20, 30, and 40 W) and exposure times (30 to 360 s). Oxygen plasma cannot chemically modify zeolite to a considerable extent, but it can clean the surface, open blocked pores, and induce the formation of additional OH groups via exposure to humidity in ambient air. Therefore, Cd <sup>+2</sup> ion removal	2019	<a href="https://doi.org/10.3906/kim-1808-14">https://doi.org/10.3906/kim-1808-14</a>



		is increased by approximately 10% with the plasma treatments. Infrared-attenuated total reflectance spectroscopy, X-ray diffraction, scanning electron microscopy, and energy dispersive spectroscopy were applied to analyze the changes in the surface structure and properties of the samples.		
<b>POLYVINYL CHLORIDE MEMBRANES GRAFTING WITH POLYACRYLIC ACID VIA AR-PLASMA TREATMENT</b>	Fuel cells	This work explores the synthesis and properties alteration of new composite membrane system based on polyvinyl chloride (PVC) grafting with polyacrylic acid (PAA) using argon (Ar) plasma. The membranes of PVC were synthesized by solution-casting method, where PAA was deposited onto PVC using dielectric barrier discharge (DBD) at atmospheric pressure with different carrier gases such as (O <sub>2</sub> , Ar, N <sub>2</sub> , air) to get the optimum condition for grafting process of acrylic acid. Physicochemical properties were investigated as function of varied carrier gas for grafting process of PAA. ATR-FTIR has provided information on details of chemical structure of membrane, while morphological changes are	2019	<a href="https://doi.org/10.21608/ABSB.2019.67895">10.21608/ABSB.2019.67895</a>

characterized by scanning electron microscope (SEM). Moreover, mechanical properties of the membranes were studied using tensile strength (TS). Surprising, the wettability behavior of modified PVC membrane with AA vapor (plasma polymerization) is closed to such membranes those treated with O<sub>2</sub> plasma-AA liquid. An ultra-thin, pin hole free films of PAA were deposited onto PVC membranes leading to the increase of the wettability feature of the membranes. Meanwhile, ion exchange capacity (IEC) of such membranes was investigated by volumetric method and it is directly dependent on the electrochemical properties of membranes. The IEC values in case of grafting with PAA in vapor phase are promising and maybe related to the special structure of plasma deposited polymers. The grows in the electronegativity of the grafted and sulfonated membranes is an indication to the proton permeability. Therefore, such membranes may be used as polyelectrolyte membranes (PEM) in direct methanol fuel cell (DMFC).

<p>Synthesis and biological activities of polymer–thorium (IV) nanocomposites</p>	<p>Polymer for biomedical applications</p>	<p>In this investigation radical induced copolymerization reaction of vinylpyridine (VP)-Thorium (Th(IV)) complex with pure methylmethacrylate in dimethylsulfoxide using azobisisobutyronitrile as initiator led to formation of polymer metal composite. The prepared polymer composite was characterized by elemental analysis, Fourier transform infrared (FT-IR) spectroscopy, thermogravimetric analysis, scanning electron microscopy (SEM), transmission electron microscope and X-ray diffraction. FT-IR results showed that the metal ion is coordinated via the nitrogen of VP. The solubility of Th(IV) complex and the formed polymer composite in polar and non-polar solvents was also tested. However, the conductivity measurements revealed nonelectrolytic nature of the complex. Moreover, the thermal properties of the prepared composite and their antitumor and antimicrobial activities were discussed. Additionally, in this work not only the nanocomposite as bulky</p>	<p>2019</p>	<p><a href="https://doi.org/10.1002/pc.24970">https://doi.org/10.1002/pc.24970</a></p>
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		materials (powder) but thin films also were deposited utilizing electrospray deposition technique. The produced films have been reduced growth of gram-negative <i>Escherichia coli</i> by ~99.1%. The morphology of the prepared film was studied by SEM and atomic force microscopy.		
Modeling and optimizing Acid Orange 142 degradation in aqueous solution by non-thermal plasma	Water treatment	The effects of the high voltage <a href="#">electrode material</a> , initial pH of the solution, initial concentration of $Fe^{2+}$ , and time of plasma treatment on the efficiency of Acid Orange 142 (AO142) degradation were studied and evaluated. Furthermore, based on the Box–Behnken <a href="#">response surface methodology</a> (BBD-RSM), a model between response (decolorization efficiency %) and influencing factors was proposed to estimate the interactive effects and optimize the process conditions. The proposed model was adequate with an $R^2$ of 0.8005 which is in reasonable agreement with the $R^2_{adj}$ of 0.9307. According to the model, the optimum conditions were steel as a high voltage electrode, an initial pH 3.0, an initial $Fe^{2+}$ concentration 0.9 mM, and	2018	<a href="https://doi.org/10.1016/j.chemosphere.2018.06.174">https://doi.org/10.1016/j.chemosphere.2018.06.174</a>

			20 min time of treatment to obtain a decolorization efficiency of 95.05%. In addition, the analytical results of UV-Vis, FT-IR, <a href="#">TOC</a> and GC-MS indicated the degradation of the dye molecule.		
	Thermo-and pH-sensitive hydrogel membranes composed of poly(N-isopropylacrylamide)-hyaluronan for biomedical applications: Influence of hyaluronan incorporation on the membrane properties	Polymer for biomedical applications	Interpenetrating hydrogel membranes consisting of pH-sensitive <a href="#">hyaluronan</a> (HA) and thermo-sensitive poly(N-isopropylacrylamide) (PNIPAAm) were synthesized using redox polymerization, followed by <i>N,N</i> -methylenebisacrylamide (BIS) and epichlorohydrin (EPI) were added as chemical crosslinkers. The interaction between membrane compositions has been characterized by <a href="#">FTIR spectroscopy</a> and discussed intensively. The result indicates that HA incorporation in membranes increase the gel fraction, swelling uptake, and the flexibility/elasticity of crosslinked membranes, however it reduced oppositely the mechanical elongation of membranes. PNIPAAm-HA hydrogels responded to both temperature and pH changes and the stimuli-responsiveness was reversible. However, <i>in vitro</i> bioevaluation results revealed	2018	<a href="https://doi.org/10.1016/j.ijbiomac.2017.08.011">https://doi.org/10.1016/j.ijbiomac.2017.08.011</a>

		that the released <a href="#">ampicillin</a> during the burst release time was sharply influenced and increased with increasing HA contents in membranes; afterwards it became sustainable. Whereas, high HA contents in hydrogels unexpectedly impacted negatively on the <a href="#">cells viability</a> , owing to the viscosity of cell culture media changed. A big resistance was observed against <a href="#">microbial growth</a> of <a href="#">Staphylococcus aureus</a> , <a href="#">Salmonella typhi</a> , and <a href="#">Candida albicans</a> in case of pure PNIPAAm hydrogel membranes without HA or ampicillin. However, HA incorporation or the loaded ampicillin in membranes showed unexpected easily microbial growth. The fast release performance with dual pH-thermo-sensitive hydrogels were suggested as promising materials for quick drug carrier in the biomedical field.		
XPS and IR studies of plasma polymers layer deposited from allylamine with addition of ammonia	Material science and plasma chemistry	The plasma polymerization of allylamine was often investigated to modify polymer surfaces with primary amino groups. However, this deposition process is	2018	<a href="https://doi.org/10.1016/j.apsusc.2018.07.160">https://doi.org/10.1016/j.apsusc.2018.07.160</a>

		<p>characterized by a significant loss of <math>\text{NH}_2</math> groups originally present in allylamine. To compensate this loss of <math>\text{NH}_2</math> groups in the deposited plasma polymer layer ammonia was added to the plasma process. Indeed, huge amount of nitrogen could be incorporated into the plasma polymer using addition of ammonia but the yield in primary amino groups was not increased. Extensive side-reactions were observed.</p> <p>Such <math>\text{NH}_2</math> group-enriched polymer surfaces are interesting for bio-applications.</p> <p>The influence of <math>\text{NH}_3</math> addition to allylamine on the yield of primary amino groups was characterized using FTIR-ATR, X-ray photoelectron spectroscopy and differential scanning calorimetry.</p>		
One-step synthesis of silver nanoparticles embedded with polyethylene glycol as thin films	Nanoscience	<p>Silver nanoparticles (Ag NPs) embedded and stabilized with polyethylene glycol (PEG) were synthesized as colloids by heating and exposure to sunlight (direct and indirect) irradiation as green method. The deposition of Ag NP-PEGs onto Si-wafers was also made using the electrospray ionization deposition</p>	2017	<a href="https://doi.org/10.1080/01694243.2016.1259728">https://doi.org/10.1080/01694243.2016.1259728</a>

		<p>technique. The generating of Ag NP-PEGs as colloids was examined by UV-visible spectroscopy (UV-Vis) and transmission electron microscopy (TEM). The chemical composition of the resulted nanocomposites was evaluated by Fourier transform infrared (FTIR) and that of thin-film surfaces by X-ray photoelectron spectroscopy. Structure-property relationships of Ag-PEG nanocomposites prepared by heating were discussed in dependence on the time of heating. The UV-visible results confirmed the successful synthesis of spherical Ag NPs with absorption peaks at a wavelength of <math>\lambda = 413</math> nm for the heating method and at <math>\lambda = 418</math> as well as 449 nm for direct and indirect exposure to the sunlight. Ag-PEG nanocomposite thin films showed excellent antimicrobial activity. These results revealed that the Ag-PEG nanocomposites thin films can be used as potential materials in biomedical applications.</p>		
Tuned interactions of silver nanoparticles with ZSM-5 zeolite by adhesion-promoting	Material Science and plasma chemistry	The electrospray ionization (ESI) method was used for deposition of thin films of poly(acrylic acid) (PAA) on Cu/ZSM-5 (5 wt.% Cu)	2017	<a href="https://doi.org/10.1080/01694243.2017.1315910">https://doi.org/10.1080/01694243.2017.1315910</a>

<p>poly(acrylic acid) deposited by electrospray ionization (ESI)</p>		<p>and Ag–Cu/ZSM-5 (1 wt.% Ag and 4 wt.% Cu) composites. For comparative purposes, the ZSM-5 zeolite was synthesized under hydrothermal conditions and loaded with PAA under the same treating conditions as the composites. This method allowed the formation of uniform polymer films of controlled thickness on conductive substrates. The structural characteristics were characterized by X-ray photoelectron spectroscopy, Fourier-transform infrared spectroscopy, atomic force microscopy and X-ray diffraction (XRD). The deposited PAA layer over ZSM-5 acts as a common dispersing and stabilizing agent through coordination-driven guest-templated polymer via interaction of <math>\text{Ag}^+</math> and <math>\text{Cu}^{2+}</math> with carboxylic acid groups, thus increasing and controlling the adhesion and the release of metallic species. A short exposure to light and temperature has reduced the metal ions to <math>\text{Cu}^0</math> and <math>\text{Ag}^0</math> metallic nanoparticles. The results of XRD analysis let suggest that the interaction of Cu and Ag with carboxylic groups of PAA</p>		
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		inhibits the formation of large metallic silver particles. These samples were being studied for their potential as antibacterial agents toward the bacterial strains such as <i>Staphylococcus pneumonia</i> , <i>Bacillus subtilis</i> , <i>Escherichia coli</i> and <i>Pseudomonas aeruginosa</i> as Gram positive and Gram-negative bacteria, respectively. <i>Aspergillus fumigatus</i> and <i>Candida albicans</i> as Fungi were also evaluated. The Cu/ZSM-5 and Ag-Cu/ZSM-5 nanocomposites coated with a 10 nm thick PAA layer exhibit significant antibacterial activity.		
Influence of Poloxmer on the Dissolution Properties of Mosapride and Its Pharmaceutical Tablet Formulation	Material science	This work was an attempt to improve therapeutic efficacy and increase patient compliance thereby formulating immediate release of Mosapride citrate's tablets with improved physical and chemical characteristics. The tablet form was prepared by wet granulation of Mosapride with a binder solution of Poloxmer 407 and compressed the dried granules of Mosapride into non-friable, stable tablets. The other objective, the performance of two	2017	<a href="https://doi.org/10.21608/EJCHEM.2017.3685">10.21608/EJCHEM.2017.3685</a>

		classes of superdisintegrants as croscarmellose sodium (Ac-Di-Sol), and sodium starch glycolate (Primojel) in dissolution of Mosapride immediate release and promoting disintegration tablets was evaluated. The post-compression and the pre-compression parameters were characterized which within their respective standards must lie. Chemical composition and crystallinity were investigated via FTIR and XRD, respectively. The post compression parameters such as thickness test, hardness, friability testes and in vitro drug release studies were also performed.		
Ultra-Thin Films of Poly(acrylic acid)/Silver Nanocomposite Coatings for Antimicrobial Applications	Material science and plasma chemistry	In this work not only colloids of poly(acrylic acid) (PAA) embedded with silver nanoparticles (Ag-NPs) but thin films (10 nm) also were deposited using electrospray deposition technique (ESD). A mixture of sodium borohydride ( $\text{NaBH}_4$ ) and ascorbic acid (AA) were utilized to reduce the silver ions to generate Ag-NPs in the PAA matrix. Moreover, sodium tricitrate was used to stabilize the prepared colloids. The obtained colloids and films were characterized using UV-	2016	<a href="https://doi.org/10.1155/2016/7489536">https://doi.org/10.1155/2016/7489536</a>

		<p>visible, transmission electron microscopy (TEM). UV-Vis results reveal that an absorption peak at 425 nm was observed in presence of PAA-AgNO<sub>3</sub>-AA-citrate-NaBH<sub>4</sub>. This peak is attributed to the well-known surface plasmon resonance of the silver bound in Ag-NPs, while the reduction was rendering and/or inhibiting in absence of the AA and citrate. FTIR spectroscopy was used to study the mechanism of the reaction process of silver nitrate with PAA. TEM images showed the well dispersion of Ag-NPs in the PAA matrix with average particle size of 8 nm. The antimicrobial studies showed that the Ag-NPs embedded in the PAA matrix have proven to have a significant antimicrobial activity against <i>E. coli</i>, <i>B. subtilis</i>, and <i>C. albicans</i>.</p>		
Reaction of CO <sub>2</sub> Gas with (radicals in) Plasma-Polymerized Acrylic Acid (and Formation of COOH-Rich Polymer Layers)	Material science and plasma chemistry	<p>In contrast to most of the existing literature on plasma polymerization of acrylic acid (AA), not only the chemical structure and film thickness of the deposits were studied, but also a new way to obtain COOH-rich surfaces were studied. This is an important aspect when applying the obtained coatings for</p>	2016	<a href="https://doi.org/10.1002/ppap.201500128">https://doi.org/10.1002/ppap.201500128</a>



		biomedical and electronics applications. Therefore, acrylic acid/CO <sub>2</sub> polymer films with a thickness of ca. 150 nm were deposited in the pulsed plasma regime onto polyethylene and aluminum. Their structure–property relationships were studied in dependence on the mixture ratio of acrylic acid monomer and CO <sub>2</sub> gas. The influence of the CO <sub>2</sub> gas on the regularity and functionality of plasma-deposited poly(acrylic acid) (PAA) was studied in detail using bulk-sensitive (FTIR) as well as surface-sensitive methods, such as X-ray photoelectron spectroscopy. Results obtained show, in presence of a small amount of CO <sub>2</sub> gas within the acrylic acid plasma, a structure of PAA with high concentration of COOH groups was estimated. A polymer network is obtained with an increasing abundance of branched groups for AA/CO <sub>2</sub> with increasing CO <sub>2</sub> gas in the mixture.		
Plasma polymerized allyl alcohol/O <sub>2</sub> thin films embedded with silver nanoparticles	Material science and plasma chemistry	The simple production of a new type of <i>anti</i> -bacterial <a href="#">polymer coating</a> with embedded silver <a href="#">nano particles</a> is described. This biologically active polymer layer	2016	<a href="https://doi.org/10.1016/j.tsf.2016.08.045">https://doi.org/10.1016/j.tsf.2016.08.045</a>

was deposited using the [plasma polymerization](#) of allyl alcohol. Then, these plasma polymer layers were impregnated with [silver ions](#) by dipping into a solution of silver nitrate. Subsequently,  $Ag^+$  was reduced by the polymer itself and more completely by dipping into a solution of [sodium boron hydride](#). Addition of  $O_2$  gas to the allyl alcohol monomer was used to increase the concentration of O functional groups in the layer and to improve the fixation of homogeneously distributed silver nano-particles. The thus produced films have been reduced growth of gram-negative *Escherichia coli* by > 99%. The morphology of prepared films was studied by Scanning Electron Microscopy and [Atomic Force Microscopy](#). Chemical compositions in the whole layer and on the surface of films were investigated using Fourier transform infrared and X-ray photoelectron spectroscopy, respectively.

Adsorption of Cadmium Ions onto Zeolite-A prepared from	Water treatment	Zeolite-A has been prepared from Egyptian kaolin to remove divalent	2016	10.21275/v5i7.ART2016515



<p>Egyptian Kaolin using Microwave Technique</p>		<p>cadmium ion from wastewater. The synthesized zeolite was characterized by X-ray diffraction (XRD) and scanning electron microscopy (SEM). A batch technique was employed as a function of temperatures, contact time and pH of the solution. Zeolite-A morphology was observed by SEM analysis, and it showed well-defined crystals slightly different sized crystals of the same cubic shape. Results revealed that the optimum conditions of the adsorption process are: zeolite dose= 0.25g in 25 mL of Cd(II) with contact time of 140 min, 333 K and pH 7.5. Two equations, namely pseudo-first order and pseudo-second order have been used to determine the kinetics of removal process. The collected kinetic data showed that pseudosecond order equations controls the adsorption. Chemisorption process and Langmuir isotherm proved best fitting to the experimental data. The adsorption mechanism was based on cation exchanges of Cd<sup>2+</sup> ions present in wastewater and the available Na<sup>+</sup> ion.</p>		
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<p>SYNTHESIS, CHARACTERIZATION AND BIOLOGICAL ACTIVITY OF POLYMER NICKEL (II) COMPLEX</p>	<p>Material science</p>	<p>4-vinyl pyridine nickel complex containing polymerizable vinyl group, prepared by condensing (4:1 molar ratio) of 4-vinyl pyridine with Nickel chloride, then polymerized with methyl methacrylate at 70 °C using AIBN as initiator. Metal complex and polymer metal complex have been characterized by elemental analyses, molar conductance, IR, <sup>1</sup>H-NMR , Mass spectra and thermal analyses (DTA and TGA). Conductivity measurement reveals the nonelectrolytic nature of the complex. This confirms that, the anion is coordinated to the metal ion. The IR reveal the metal ion is coordinated via the nitrogen atom of 4-VP. Nickel complex and polymer nickel complex have been tested invitro against number of tumor and number of microorganisms in order to assess their anti tumor and antimicrobial properties. The antimicrobial activity was observed by compounds VP-Ni and MMA-VP-Ni under the screening conditions. The activity against HCT-116 cells was detected for compound VP-Ni (with IC<sub>50</sub> value</p>	<p>2016</p>	<p><a href="#">SYNTHESIS-CHARACTERIZATION-AND-BIOLOGICAL-ACTIVITY-OF-POLYMER-NICKEL-II-COMPLEX.pdf (researchgate.net)</a></p>
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			9.8±0.6 µg/ml), compared with reference standard (24.6±0.3 µg/ml) followed by MMA-VP-Ni (48.3±1.5). In conclusion, this study highlighted the synthesis of polymer nickel complex, and proved the promising biological activity of the synthesized compounds.		
SYNTHESIS AND BIOLOGICAL ACTIVITIES OF POLYMER-IRON (III) COMPLEX BASED ON 4-VINYL PYRIDINE	Material science	Reaction of Fe (III) with 4-vinyl pyridine in non aqueous medium led to the formation of metal complex. This complex reacted with methyl methacrylate by using azobisisobutyronitrile (AIBN) as initiator to form the polymer metal complex. This metal complex and polymer metal complex have been characterized by elemental analyses, molar conductance, IR, <sup>1</sup> H-NMR, Mass spectra and thermal analyses (DTA and TGA). The molar conductance of the complex indicating that, the complex is not electrolytes. This confirms that, the anion is coordinated to the metal ion. The IR data show that the metal ion is coordinated via the nitrogen atom of 4-VP. The metal VP-Fe complex and Polymer Fe Complex have been tested in vitro against number of tumor and number of	2016	<a href="#">SYNTHESIS-AND-BIOLOGICAL-ACTIVITIES-OF-POLYMER-IRON-III-COMPLEX-BASED-ON-4-VINYL-PYRIDINE.pdf (researchgate.net)</a>	

		microorganisms in order to assess their anti tumor and antimicrobial properties. Interestingly, the tested compound MMA-VP-Fe also exhibited highest tendency to inhibit Gram positive bacteria than Gram negative bacteria along with its activity against the tested filamentous fungi ( <i>Aspergillus fumigatus</i> ). Good antitumor activity against HCT-116 cells was detected for compound VP-Fe with IC50 value of $17.8 \pm 1.3$ , compared with reference standard ( $24.6 \pm 0.3 \mu\text{g/ml}$ ) followed by MMA-VP-Fe ( $88.3 \pm 1.2 \mu\text{g/ml}$ ). The obtained results revealed the moderate biological activities of the synthesized VP-Fe complex and polymer Fe complex.		
Poly(vinyl alcohol)-hyaluronic Acid Membranes for Wound Dressing Applications: Synthesis and <i>in vitro</i> Bio-Evaluations	Polymer for biomedical applications	Physically crosslinked poly(vinyl alcohol)-hyaluronic acid (PVA-HA) hydrogel membranes composed of different amounts of HA were prepared by freeze-thawing (F-T) method. F-T cycle was repeated for three consecutive cycles. HA was chosen and routinely utilized in the local treatment of chronic wounds, because of its advantages as, HA is endogenous and biodegradable polymer. Physicochemical	2015	<a href="https://doi.org/10.5935/0103-5053.20150115">https://doi.org/10.5935/0103-5053.20150115</a>

properties of PVA-HA membranes such as, gel fraction (GF), swelling, mechanical properties, hydrolytic degradation and *in vitro* bio-evaluation tests were investigated. Results revealed that introducing HA into PVA structure affected significantly the physicochemical properties of membranes than the pristine PVA, because of its crosslinking interaction with PVA. With the increase of HA content in PVA hydrogel membranes, GF and mechanical stability of PVA-HA membranes decreased. However, the swelling behavior, mechanical flexibility, protein adsorption and hydrolytic degradation of PVA membrane increased. The HA content < 20% in PVA hydrogels showed high cell viability (%) and no toxicity was observed using microculture tetrazolium assay (MTT-assay). However, less cell viability was determined with high HA incorporation. PVA-HA-ampicillin free showed antimicrobial activity against *Candida albicans* as a result of HA presence. Thus, ampicillin-loaded wound dressing with PVA-HA membranes could be

			used as promising materials with easy forming and biologically evaluated for wound care.		
	Ion Conducting Nanocomposite Membranes Based on PVA-HA-HAP for Fuel Cell Application: II. Effect of Modifier Agent of PVA on Membrane Properties	Polymer for fuel cells applications	This work explores the synthesis and properties alteration of new nanocomposite membrane system based on polyvinyl alcohol (PVA) blended with hyaluronic acid (HA) and hydroxyapatite (HAP) as nanofiller. The membranes were synthesized by solution-casting method, where PVA was initially modified with orthophosphoric acid (OPA) or sulphuric acid and then epichlorohydrin (EPI) was employed as chemical crosslinker. Physicochemical properties of composite membranes <i>e.g.</i> gel fraction (%), swelling degree and mechanical stability were estimated, depending on PVA modifier agent alteration. Results revealed that the PVA-modifier agent type influenced sharply on most membrane properties. For example, the swelling ability of PVA-HA-HAP composite membranes was reduced apparently with increasing H <sub>2</sub> SO <sub>4</sub> amount as used for PVA modification, unlike it was increased with the used amount of OPA for the	2015	<a href="https://doi.org/10.1016/S1452-3981(23)06747-0">https://doi.org/10.1016/S1452-3981(23)06747-0</a>

		<p>same purpose. The mechanical properties were improved with increasing the amount of EPI until certain extent, whereas they have deteriorated controversially with addition of high incorporated amounts of HAP or using high amounts of OPA or <math>H_2SO_4</math> for PVA modification. Meanwhile, electrochemical properties of PVA-HA-HAP composite membranes showed a big improvement in ionic conductivity with PVA modification and HAP incorporation as well. An one-dimensional matlab model is developed to study the performance of DMFC for different new composite membranes. Both experimental and modeled performance of different membranes in DMFC were compared and discussed in details.</p>		
Structure of Plasma Poly(Acrylic Acid): Influence of Pressure and Dielectric Properties	Material science and plasma chemistry	<p>Thin poly(acrylic acid) PAA films were deposited by pulsed plasma polymerization on different organic and inorganic substrates. The structure-property relationships of the deposited acrylic acid polymers were studied in dependence on the monomer pressure by various techniques and probes. The surface</p>	2015	<a href="https://doi.org/10.1007/s11090-014-9603-8">https://doi.org/10.1007/s11090-014-9603-8</a>



and bulk properties of the plasma deposited films were investigated by X-ray photoelectron spectroscopy, attenuated total reflection infrared, and broad band dielectric spectroscopy. The experimental infrared frequencies of PAA films are compared with those predicted from quantum mechanical calculation. The concentration of the COOH groups in the film (stored in ambient air) decreased by about 15 % compared to the as-prepared sample. The plasma deposited PAA probably form a highly branched product. However, the dielectric measurements show that in addition to the hydrogen bonds, self condensation process was able to hinder the localized fluctuation as well. These processes lead to form a cross-linked network polymer film. Nevertheless, a low energy is sufficient to break these processes during heating at atmospheric pressure. Therefore, homogenized samples with free branches (functional group) were obtained after a first heating with structures close to conventional polymerized

			acrylic acid. Thus, a thermally stable product was obtained.		
	Influence of water addition on the structure of plasma-deposited allyl alcohol polymer films	Material science and plasma chemistry	One hundred and fifty nanometre thick polymer films made of allyl alcohol and H <sub>2</sub> O addition were deposited onto aluminium substrates using the radio-frequency (rf) pulsed plasma mode. The structure–property relationships of polymer films were studied in dependence on the precursor ratio allyl alcohol–water. Both the regularity of structure and composition of such thin films in comparison to chemically polymerized allyl alcohol were investigated using by bulk-sensitive Fourier transform infrared spectroscopy (FTIR) in the spectral range of 4000–500 cm <sup>-1</sup> as well as surface-sensitive X-ray photoelectron spectroscopy (XPS). The intention of this work was to increase the yield in OH groups by addition of water to the allyl alcohol precursor. For an unambiguous identification of the functionality of the deposited films, the OH groups were labelled with trifluoroacetic anhydride and subsequently measured by XPS as well as quantitatively by FTIR. As expected,	2015	<a href="https://doi.org/10.1080/01694243.2015.1011367">https://doi.org/10.1080/01694243.2015.1011367</a>

		the O/C ratio grew with increasing water admixture by oxidation of both the plasma polymerized allyl alcohol layer to preferably aldehyde and/or carboxylic acid groups. In contrary, the concentration of OH groups in the deposited polymer film decreases dramatically with increasing admixture of water to the allyl alcohol plasma. It has been shown that the additional water has produced preferably higher oxidized C-O <sub>x</sub> species with two or three C-O bonds. This fits also very well with the observation that almost no deuterium is introduced into the surface of plasma polymer if D <sub>2</sub> O was added instead of H <sub>2</sub> O.		
SILVER/POLYETHYLENE GLYCOL NANOCOMPOSITE THIN FILMS AND ITS BIOLOGICAL APPLICATIONS	Polymer for biomedical applications	The synthesis of silver nanoparticles with different sizes and concentrations was carried out using NaBH <sub>4</sub> as a reducing agent and polyethylene glycol (PEG) as a stabilizer. The thin films of PEG embedded with Ag nanoparticles (Ag NPs) were deposited by electrospray deposition technique (ESD) and the morphology of subsequent prepared films was studied by AFM. Structure-property relationships of the colloid and	2015	<a href="https://core.ac.uk/doi/pdf/10.3390/322470403">322470403.pdf (core.ac.uk)</a>

		subsequent films were discussed in dependence on the concentration of NaBH <sub>4</sub> . The synthesized Ag/PEG nanocomposite solution was characterized by UV-visible spectroscopy and Transmission electron microscopy (TEM). Chemical composition in the whole and on the surface of films were investigated by Fourier transform infrared (ATR-IR) and X-ray photoelectron microscopy (XPS), respectively. The UVvisible results indicate to the formation of spherical Ag NPs where the absorption peak was observed at wavelengths around 395 nm. TEM images showed the well dispersion of Ag NPs in the PEG matrix with average particle size of 13 nm. Furthermore, the antimicrobial activity of the nanocomposite was studied. The Ag NPs released from the polymer matrix proven to have a significant antimicrobial activity against S. Pneumonia, B. Subtilis, E. Coli, and A. Fumigates.		
POLYELECTROLYTE NANOCOMPOSITE MEMBRANES BASED ON PVAHA-HAP FOR FUEL	Polymer for fuel cells applications	Novel composite membranes prepared by blending hyaluronic acid (HA) with modified polyvinyl alcohol (PVA) and hydroxyapatite	2015	<a href="#">POLYELECTROLYTE-NANOCOMPOSITE-MEMBRANES-BASED-ON-PVA-HA-HAP-FOR-CELL-APPLICATIONS-SYNTHESIS-AND-APPLICATION.pdf (researchgate.net)</a>



CELL APPLICATIONS:  
SYNTHESIS AND  
APPLICATION

as nano-filler (HAP), followed by ex-situ crosslinking with epichlorohydrin (EPI) to achieve the desired chemical and mechanical stability, are reported for use as nanocomposite polyelectrolyte membranes (PEM) in direct methanol fuel cell (DMFC). In this work, PVA-HA-HAP membranes are synthesized by solution-casting method using EPI as chemical crosslinker. PVA is first modified using orthophosphoric acid (OPA) for creating the ion conducting property. Different concentrations of HA, HAP and OPA modifier agent are used. Some physicochemical properties e.g. water uptake, gel fraction, mechanical and thermal properties were determined as function of varied membrane components. In addition, PVA-HA-HAP membranes molecular structure is verified by FTIR, while morphological changes due to addition of HAP is investigated by SEM. Results revealed that addition HAP and modification of PVA with OPA in different contents affected sharply on physicochemical and electro-chemical properties of

		obtained PVA-HA-HAP membranes. It was noticed that addition of HAP decreased the swelling ability and improved the thermal and mechanical properties of PVA-HA-HAP, as compared to pristine PVA-HA membranes. Whereas, both the modification of PVA with OPA and HAP nano-fillers incorporation created ionic conduction, which result in electrochemical properties improvement such as, ion exchange capacity (IEC) values and ionic conductivity.		
Comparative Studies for Adsorption Processes of Transition Element Cu(II) Ions by Macroporous Cation Exchange Resin	Water treatment	In this work the adsorption processes are carried out on Cu+2 ions from aqueous solution in presence of macroporous cation exchange resin (AMBERSEP 252H) at different temperatures. The different parameters such as concentrations of metal ions, temperatures and presence of acid were studied. The obtained adsorption data fitted on the linear equation of Langmuir, Freundlich, Temkin-Pyzhev and Dubinin-Radushkevich isotherm models. The effect of temperature on the adsorption was performed to evaluate the influence of Cu+2 ions	2015	<a href="http://297-306.pdf(curreweb.com)">297-306.pdf (curreweb.com)</a>

		adsorption capacity. Additionally, thermodynamic parameters ( $\Delta H$ , $\Delta S$ , $\Delta G$ ) were determined. The removal efficiency copper ions from aqueous medium using such resin was 98.7%. Moreover, the experimental isotherm models were evaluated for the Langmuir, Freundlich, Temkin and D-R isotherms. Therefore, the correlation coefficient ( $R^2$ ) indicates the following order to fit model with adsorption mechanism of copper ions ( $Cu^{+2}$ ) onto the resin : Langmuir > D-R > Temkin > Freundlich.		
SYNTHESIS AND CHARACTERIZATION OF POLY(VINYL ALCOHOL)-HYALURONIC ACID BLENDED HYDROGEL MEMBRANES	Polymer for biomedical applications	Poly(vinyl alcohol)PVA is a hydrophilic polymer and water soluble . It is used in many biomedical and pharmaceutical applications, due to its advantages such as: non-toxic, non-carcinogenic, and biodegradable characteristics with the ease of processing. Physically cross-linked hydrogel membranes composed of different amounts of hyaluronic acid (HA) blend with (PVA) were prepared by freeze–thawing method. This freezing–thawing cycle was repeated for three consecutive cycles. Properties of (PVA–HA)	2014	<a href="https://doi.org/10.21608/AJPS.2014.6965">10.21608/AJPS.2014.6965</a>

		hydrogel membrane such as gel fraction, swelling, mechanical properties(tensile strength, elongation to break),degradation and protein adsorption were investigated. With the increasing of HA content, the gel fraction, the maximum tensile strength and elongation at break(%) of (PVA-HA) hydrogel membranes were decreased. Furthermore, with the increase of HA content, the swelling, the protein adsorption and the hydrolytic degradation of PVA-HA hydrogel membrane were increased.After soaking of hydrogel membrane for three days in phosphate buffer saline (PBS), the maximum weight loss of PVA-HA hydrogel membranes ranged between 18% and 70% according to HA content, this indicates that they are biodegradable.		
Structure of Plasma-Deposited Copolymer Films Prepared from Acrylic Acid and Styrene: Part II Variation of the Comonomer Ratio	Material science and plasma chemistry	Copolymers of acrylic acid and styrene (AA/S) were prepared by pulsed plasma deposition technique. Their structure-property relationships were studied in dependence on the comonomer ratio. Both, the regularity of the structure and the composition of the thin	2013	<a href="https://doi.org/10.1002/ppap.201200110">https://doi.org/10.1002/ppap.201200110</a>

		<p>copolymer films were investigated by bulk-sensitive (dielectric spectroscopy, FTIR, and differential scanning calorimetry) as well as surface-sensitive methods such as X-ray photoelectron spectroscopy (XPS). For an unambiguous identification of the functionality of the deposited films the COOH groups were estimated by derivatization with trifluoroethanol and subsequent XPS measurement as well as by the quantitative analysis of the FTIR data. As a result, the concentration of COOH groups on the surface and in the bulk is increasing with the fraction of AA in precursor mixture in a non-monotonous way but similar to the dependence obtained by conventional free radical polymerization.</p>		
<p>Degradation behavior of thin polystyrene films on exposure to Ar plasma and its emitted radiation</p>	<p>Material science and plasma chemistry</p>	<p>Spin-coated films of amorphous polystyrene (PS) were exposed to argon plasma for a few seconds to several minutes. The PS film was either in direct contact with the plasma or was shielded from the direct plasma contact by filters with different cutoff wavelengths in the vacuum UV region or by a Faraday</p>	<p>2013</p>	<p><a href="https://doi.org/10.1080/01694243.2012.705528">https://doi.org/10.1080/01694243.2012.705528</a></p>



cage (FC) made from metal mesh to prevent the impinging of charged species. Only energy-rich neutrals and plasma radiation may be operative in presence of the FC. lithium fluoride (LiF) filter protects the sample from direct contact with the plasma. Wavelengths of plasma radiation shorter than  $c. 105 \text{ nm}$  ( $\approx 11.8 \text{ eV}$ ) were cut off. Glass filters made of fused  $\text{SiO}_2$  have a cutoff

at  $\approx 175 \text{ nm}$  completely the vacuum UV radiation of plasma (ca.  $175 \text{ nm} \approx 7.0 \text{ eV}$ ). These energies are sufficient to produce C–C, C–H bond scissions in case of direct Ar plasma exposure and Ar plasma exposure with use of the LiF filter. Only quartz glass shielding did not produce significant effects on the polymer surface in comparison to the reference PS, either in surface energy or O/C ratio or in IR spectra. Oxygen plasma has worked most aggressive and had etched the PS film, thus establishing a steady state between introduction of new oxygen functionalities and polymer etching. Ar plasma exposure produces also oxidation and etching of the polymer

			films as the oxygen plasma. Using of a FC during Ar plasma exposure or the LiF filter a slightly weaker oxidation was observed.		
	Reaction of Water with (Radicals in) Plasma Polymerized Allyl Alcohol (and Formation of OH-Rich Polymer Layers)	Material science and plasma chemistry	The pulsed plasma polymerization of allyl alcohol was employed under the aspect of maximal retention of OH groups and the formation of a regular polymer structure. It should be noted that earlier investigations on plasma polymers deposited from allyl alcohol did not show extensive postplasma addition of oxygen and water vapor from ambient air during storage, measuring the elemental O/C ratio by means of X-ray photoelectron spectroscopy (XPS). The identification of OH groups in the plasma polymerized polymer using FTIR spectroscopy was such an indicator for fragmentation. The peak area of OH groups in the film which was stored was increased by about 20% compared to that measured ("in situ"). These phenomenons reflected that moisture and O <sub>2</sub> in air played an important role in scavenging the free radicals. The addition of water and more specifically chemical bonding of OH of water in the deposited	2013	<a href="https://doi.org/10.1021/jp406186x">https://doi.org/10.1021/jp406186x</a>

		plasma polymer may serve as an indicator for monomer fragmentation, poly recombination, and the remaining radicals responsible for film formation. Moreover, the dielectric measurements show that the plasma deposited films are not thermally stable but undergo a postplasma chemical reaction during heating, where the reaction kinetics depends on pressure.		
Structure of Plasma-Deposited Copolymer Films Prepared from Acrylic Acid and Styrene: Part I Dependence on the Duty Cycle	Material science and plasma chemistry	Copolymers of acrylic acid and styrene (AA/S) were prepared by pulsed plasma deposition and their structures were studied in dependence on the duty cycle (DC) for a fixed composition of 1:1. As a result, low values of DC doses preserve the structure of monomers in the plasma deposited polymers while high DC leads to a higher degree of fragmentation and a loss in regular structure. Regarding plasma copolymerisation as a feasible method to finish surfaces with a definite number of functional groups it is necessary to characterize both, the chemical nature and the physical properties of the deposited layer. Therefore, a combination of	2012	<a href="https://doi.org/10.1002/ppap.201100117">https://doi.org/10.1002/ppap.201100117</a>

		different methods was employed for the characterization of thin plasma copolymer films (FTIR, dielectric spectroscopy, differential scanning calorimetry, X-ray photoelectron spectroscopy (XPS)). Special attention was paid on the unambiguous identification of COOH groups at the surface after derivatization with trifluoroethanol by XPS and in the volume by FTIR. The glass transition temperature of the copolymer system is lower than that for the both plasma deposited homopolymers and increases with the DC in difference to plasma deposited poly(acrylic acid). The dielectric measurements showed that the plasma deposited films were not thermally stable and underwent an undesired post-plasma chemical reaction. The results obtained by dielectric spectroscopy are discussed in detail in comparison with the data from FTIR and XPS measurements.		
Surface and Bulk Structure of Thin Spin Coated and Plasma-Polymerized Polystyrene Films	Material science and plasma chemistry	Polystyrene (PS) spin coated thin films were modified by O <sub>2</sub> and Ar plasma as well as by UV irradiation treatments. The modified PS samples were compared with plasma polymerized and commercial	2012	<a href="https://doi.org/10.1007/s11090-012-9372-1">https://doi.org/10.1007/s11090-012-9372-1</a>



			polystyrene. The effects of plasma (O <sub>2</sub> and Ar) and UV irradiation treatments on the surface and the bulk properties of the polymer layers were discussed. The surface properties were evaluated by X-ray Photoelectron Spectroscopy and Contact angle measurements and the bulk properties were investigated by FTIR and dielectric relaxation spectroscopy. As a result only one second treatment time was sufficient to modify the surface. However, this study was also dedicated to understand the effect of plasma and plasma irradiation on the deposited layers of plasma polymers. The dielectric measurements showed that the plasma deposited films were not thermally stable and underwent an undesired post-plasma chemical oxidation.		
	Structure property relationship of plasma polymer films - Plasma polymerization, plasma treatment and characterization methods	Material science and plasma chemistry		2012	<a href="#">OPUS 4   Structure property relationship of plasma polymer films - Plasma polymerization, plasma treatment and characterization methods (kobv.de)</a>
	Structure of Plasma-Deposited Poly(acrylic acid) Films	Material science and plasma chemistry	Poly(acrylic acid) films with a thickness of about 150 nm were deposited using a pulsed plasma onto	2011	<a href="https://doi.org/10.1002/ppap.201000108">https://doi.org/10.1002/ppap.201000108</a>



aluminum and glass. The structure/property relationships of these samples were studied in dependence to the duty cycle (DC) of the plasma by a broad combination of different techniques and probes. For the first time, volume sensitive methods (FTIR, dielectric spectroscopy, and differential scanning calorimetry) are combined with surface analyses i.e. XPS. For an unambiguous identification of COOH groups by XPS, derivatization with trifluoroethanol was accomplished. Quantitative FTIR investigations give qualitatively a dependence of the concentration of COOH groups upon DC similar to that given by XPS investigations. The observed differences are discussed considering the different analytical depths of both methods. The dielectric measurements reveal that the structure of the plasma deposited films is different from that of the bulk material. Moreover, these measurements show also that the plasma deposited films are not thermally stable but undergo a post plasma chemical reaction during

			heating, where the reaction kinetics depends on DC.		
	Structure–Property Relationship of Thin Plasma Deposited Poly(allyl alcohol) Films	Material science and plasma chemistry	Poly(allyl alcohol) films with a thickness of about 150 nm were deposited by pulse plasma polymerization onto different substrates (inorganic and organic). The structure/property relationships of these samples were studied in dependence on the duty cycle (DC) of the plasma by a broad combination of different techniques and probes. For the first time volume sensitive methods (FTIR and dielectric spectroscopy) are combined with surface analytics by employing XPS for that system. FTIR spectroscopy gives qualitatively the same dependence of the concentration of the OH groups on DC like XPS. The observed differences are discussed considering the different analytical depths of both the methods. The dielectric measurements show that the plasma deposited films are not thermally stable but undergo a post plasma chemical reaction during heating. The results obtained by dielectric spectroscopy are discussed	2011	<a href="https://doi.org/10.1007/s11090-011-9297-0">https://doi.org/10.1007/s11090-011-9297-0</a>



			in detail with the data from FTIR and XPS measurements.		
	Plasma-Initiated Polymerization and Copolymerization and Analysis of Products	Material science and plasma chemistry		2011	<a href="https://tu-berlin.de/thesis/13.10.2011">Thesis 13. 10. 2011 (tu-berlin.de)</a>