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Fabrication of hybrid nano coatings for water purification units

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Water, the most essential entity of life is continuously being adulterated due to the uncontrolled and mismanaged anthropogenic activities and the results are quite destructive. Effective measures are indispensably required to cater the on-growing deterioration of water particularly that of drinking water. Present research is one of the possible greener solutions where mixed metal oxides and polymer based photocatalytic nanocoatings are designed to treat organic/inorganic pollutants of water. Positive results were made available by synthesizing mixed-metal oxides of ZnO-MgO and ZnO-MnO₂ via co-precipitation method followed by their inclusion in multi-layered thin polymeric films using layer-by-layer (LbL) deposition. The chemical nature and bonding of the prepared ZnO-MgO and ZnO-MnO₂ were confirmed by the Fourier-transform infrared spectroscopy (FTIR) analysis while their crystallographic characteristics and phase identification were analyzed by X-ray powder diffraction studies (XPERT-PRO). Prominent IR peaks at 503.44 cm⁻¹ and 472.56 cm⁻¹ along with other characteristic peaks were recorded for ZnO-MgO and ZnO-MnO₂ which is within the fingerprint region for both types of mixed-metal oxides. Scherer's equation was used to calculate the average crystallite size of ZnO-MgO and ZnO-MnO₂ which came out to be 29.71 nm and 28.53

nm, respectively. UV-Vis spectrophotometry was utilized to determine the characteristic absorbance of ZnO-MgO and ZnO-MnO₂ at 375 nm wavelength. Successive deposition of multi-layered thin films for PEI (PSS/ZnO-MgO)_n and PEI (PSS/ZnO-MnO₂)_n layers was also recorded at 375 nm for 25 bilayer of PEI (PSS/ ZnO-MgO) and PEI (PSS/ ZnO-MnO₂), respectively with increasing absorbance per each layer. The two multilayer systems were built on cellulose acetate membrane filters for designing modular units for industrial and wastewater treatment possessing both photocatalytic degradation and waste water adsorption capabilities.

Biography

Qurat Ul Ain Nadeem is an active environmentalist who is pursuing her Doctoral research in Environmental Chemistry from Fatima Jinnah Women University, Pakistan and from Stephenson Institute for Renewable Energy, University of Liverpool under a sandwiched scholarship program funded by Higher Education Commission (HEC), Pakistan. Her research advisors include Dr. Rohama Gill and Prof. Dmitry Shchukin, the two renowned names in these particular fields. She has also worked as a Research Associate in HEC (Pakistan) funded Project No. 5461/Punjab/NRPU/R&D/HEC/2016. She has published quality research works in reputed journals and is working enthusiastically to contribute her energy into the environment of sciences.

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