World Academy of Science, Engineering and Technology
International Journal of Chemical and Materials Engineering
Vol:17, No:11, 2023

Aggregation-Induced-Active Stimuli-Responsive Based Nano-Objects for Wastewater Treatment Application

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Abstract : In the last years, controlling the self-assembly behavior of stimuli-responsive nano-objects, including micelles, vesicles, worm-like, etc., at different conditions is considered a pertinent challenge in the polymer community. The aim of the project was to synthesize aggregation-induced emission (AIE)-active stimuli-responsive polymeric nano-objects to control the self-assemblies morphologies of the prepared nano-objects. Two types of nanoobjects, micelle and vesicles, including PDMAEMA-b-P(BzMA-TPEMA) [PDMAEMA: poly(N,Ndimethylaminoethyl methacrylate); P(BzMA-TPEMA): poly[benzyl methacrylate-co- tetraphenylethene methacrylate]] were synthesized by using reversible addition−fragmentation chain-transfer (RAFT)- mediated polymerization-induced self-assembly (PISA), which combines polymerization and self-assembly in a single step. Transmission electron microscope and dynamic light scattering (DLS) analysis were used to confirm the formed self-assemblies morphologies. The controlled self-assemblies were applied as nitrophenolic compounds (NPCs) adsorbents from wastewater, thanks to their CO2-responsive part, PDMAEMA. Moreover, the fluorescence-active part of the prepared nano-objects, P(BzMA-TPEMA), played a key role in the detection of the NPCs at the aqueous solution. The optical properties of the prepared nano-objects were studied by UV/Vis and fluorescence spectroscopies. For responsivity investigations, the hydrodynamic diameter and Zeta-potential (ζ-potential) of the sample's aqueous solution were measured by DLS. In the end, the prepared nano-objects were used for the detection and adsorption of different NPCs.

Keywords : aggregation-induced emission polymers, stimuli-responsive polymers, reversible addition−fragmentation chain-transfer polymerization, polymerization-induced self-assembly, wastewater treatment
Conference Title : ICPCSP 2023 : International Conference on Polymer Chemistry and Synthetic Polymers
Conference Location : Amsterdam, Netherlands
Conference Dates : November 06-07, 2023