Fabrication of the Ag/DMAEMA@PET composites for efficiency removal of As(III) ions

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Reversible addition-fragmentation chain transfer (RAFT) polymerization is considered as the most promising synthetic route to prepare well-controlled structures with enhanced performance in specialized applications. Polymers synthesized by controlled free-radical polymerization (CRP) techniques process well-defined molecular architectures and are used in many applications such as drug-delivery, special sensing materials, molecular imprinting, polymer-protein conjugates, development of cylindrical, spherical, hyper-branched polymers, pH or temperature responding smart polymers, etc. These studies prove the versatility of CRP techniques for answering the requirements of highly functional complex polymeric architectures due to the advantages of well-defined and controllable properties achieved by these methods.

Grafting of PET track-etched membranes (TEMs) was carried out in certain ratios of 2-Dimethylaminoethyl methacrylate (DMAEMA) and xanthate-based RAFT agent, O-ethyl-S-(1-methoxycarbonyl) ethyl dithiocarbonate (RA) ([DMAEMA]/[RA]=500, 1000) in a total volume of 10 ml solution prepared using four different solvents such as water, acetone:water, ethanol:water, and ethanol. Based on the obtained data, the optimal experimental conditions were chosen: monomer concentration - 20%, solvent - acetone:water in a ratio of 1:1. All further studies were carried out under these optimal conditions.

The stabilization of Ag/DMAEMA@PET was studied as a function of loaded composites and stabilization time (it varied from 30 to 1440 min). When studying the effect of loading mass of Ag nanoparticles on the efficiency of stabilization time the mass of nanoparticles was varied from 4.7 mg/cm^2 to 7.6mg/cm^2, and the suitable stabilization time in all experiments was about 300min. Structure and composition of prepared composite TeMs were elucidated using SEM, XRD, EDX techniques.

As (III) is known as a toxic metal in aqueous media because of a high toxicity that is potentially dangerous for both human body and the environment. Therefore, development of new type of sorbents for efficient removal of toxic pollutant is an urgent task. The solution's PH was 4, the time of mixture exposure in all experiments was 600 min. The effect of removal amount of Ag/DMAEMA@PET on Arsenic solution had reached about 90 % as well that means it has acceptable potential for the removal of arsenic (III) from aqueous medium.

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