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# Preparation of Sorbent Materials for the Removal of Hardness and Organic Pollutants from Water and Wastewater

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**Abstract :** Ecological pollution is of great concern for human health and the environment. Numerous organic and inorganic pollutants usually discharged into the water caused carcinogenic or toxic effect for human and different life form. In this respect, this work aims to treat water contaminated by organic and inorganic waste using sorbent based on polystyrene. Therefore, two different series of adsorbent material were prepared; the first one included the preparation of polymeric sorbent from the reaction of styrene acrylate ester and alkyl acrylate. The second series involved syntheses of composite ion exchange resins of waste polystyrene and   amorphous carbon thin film (WPS/ACTF) by solvent evaporation using micro emulsion polymerization. The produced ACTF/WPS nanocomposite was sulfonated to produce cation exchange resins ACTF/WPSS nanocomposite. The sorbents of the first series were characterized using FTIR, <sup>1</sup>H NMR, and gel permeation chromatography. The thermal properties of the cross-linked sorbents were investigated using thermogravimetric analysis, and the morphology was characterized by scanning electron microscope (SEM). The removal of organic pollutant was determined through absorption tests in a various organic solvent. The chemical and crystalline structure of nanocomposite of second series has been proven by studies of FTIR spectrum, X-rays, thermal analysis, SEM and TEM analysis to study morphology of resins and ACTF that assembled with polystyrene chain. It is found that the composite resins ACTF/WPSS are thermally stable and show higher chemical stability than ion exchange WPSS resins. The composite resin was evaluated for calcium hardness removal. The result is evident that the ACTF/WPSS composite has more prominent inorganic pollutant removal than WPSS resin. So, we recommend the using of nanocomposite resin as new potential applications for water treatment process.

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