ABSTRACT

The present work aims at exploring the potential of three water stable metal organic frameworks (MOFs) in the context of purification and treatment of drinking water and industrial effluent.

The potential of aluminium fumarate (AlFu) MOF was investigated for remediation of fluoride from groundwater. It was incorporated in different polymeric membranes and porous beads using cellulose acetate phthalate (CAP) and polyacrylonitrile (PAN) polymers and their efficacy in fluoride remediation from synthetic solution as well as real life groundwater. 0.75 g/l AlFu MOF was good enough for complete removal of 30 mg/l fluoride concentration in feed solution. The maximum adsorption capacity for fluoride was 600, 550, 504 and 431 mg/g, respectively, at 293, 303, 313 and 333 K. The adsorption capacity of the flat sheet CAP-AlFu membranes for fluoride varied from 107 to 179 mg/g for MOF concentration of 2 to 10 wt% in membrane and 128 to 205 mg/g for MOF content (3 to 10 wt%) in PAN-AlFu hollow fiber membranes. The efficacy of the MOF as well as the mixed matrix modules were also tested for real life groundwater.

Porous chromium terephthalate (MIL-101-Cr), a highly porous MOF was employed to remove industrially relevant reactive dyes from synthetic solution as well as textile effluent. MIL-101-Cr MOF was incorporated into PAN matrix to prepare novel mixed matrix hollow fibers using an indigenous method and its performance in terms of dye removal and subsequent filtration efficiency was investigated. Maximum Langmuir adsorption capacities of nascent MIL-101-Cr for four reactive dyes were in the range of 377-397 mg/g. Performance of the MOF as well as the mixed matrix membrane in presence of salts and for real life textile effluent was also investigated.

Bactericidal MIL-100 (Fe) was synthesized in a facile green route and its application in arsenic mitigation was studied. The arsenic adsorption capacity of MIL-100 (Fe) was 160 mg/g and 90 mg/g for As (V) and As (III) species, respectively.

Keywords: *Aluminium fumarate; Metal organic framework (MOF); Mixed matrix membrane; Polymeric beads; Adsorption; Fluoride removal; MIL-101-Cr; Reactive dyes; MIL-100 (Fe); Arsenic removal; Anti-bacterial property.*