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ABSTRACT

A series of novel magnetic nanoparticles (MNPs) with various sizes for forward osmosis (FO) applications were synthesized via a one-pot reaction under mild conditions. The newly developed MNPs are coated with three different hydroacids (citric acid, oxalic acid and EDTA) carrying abundant carboxylic groups which could make the hydroacid-MNPs highly dispersible and ionizable in water. These features enable the aqueous solutions of hydroacid-MNPs to produce osmotic pressures and FO water fluxes comparable to the traditional draw solutions yet with a negligible reverse flux. The experimental results indicate that better FO performance was achieved when the hydroacid-MNPs with smaller sizes were applied to the FO process. With the model seawater of 3.5 wt% NaCl as the feed solution, the citric acid coated MNPs produced a water flux of 8.5 LMH, which is much higher than those reported for MNPs draw solutes applied in FO for seawater desalination. Additionally, the hydroacid-MNPs were readily regenerated