Nanocomposites of nanosilica-immobilized-nanopolyaniline and crosslinked nanopolyaniline for removal of heavy metals

Mohamed E. Mahmoud, Nesma A. Fekry, Mona M.A. El-Latif

PII: S1385-8947(16)30917-2
DOI: http://dx.doi.org/10.1016/j.cej.2016.06.110
Reference: CEJ 15420

To appear in: *Chemical Engineering Journal*

Received Date: 20 April 2016
Revised Date: 21 June 2016
Accepted Date: 22 June 2016

Please cite this article as: M.E. Mahmoud, N.A. Fekry, M.M.A. El-Latif, Nanocomposites of nanosilica-immobilized-nanopolyaniline and crosslinked nanopolyaniline for removal of heavy metals, *Chemical Engineering Journal* (2016), doi: http://dx.doi.org/10.1016/j.cej.2016.06.110

Nanocomposites of nanosilica-immobilized-nanopolyaniline and crosslinked nanopolyaniline for removal of heavy metals

Mohamed E. Mahmoud[a*], Nesma A. Fekry[a], Mona M.A. El-Latif[b]

[a] Faculty of Sciences, Chemistry Department, Alexandria University, P.O. Box 426, Alexandria 21321, Egypt. (E.Mail: memahmoud10@yahoo.com)

[b]Fabrication Technology Research Department, Advanced Technology and New Materials Research Institute (ATNMRI), City of Scientific Research and Technological Applications, New Borg El-Arab City, P.O. Box 21934, Alexandria, Egypt.

Abstract

Two novel nanocomposites have been designed and synthesized using simple and green functionalization of nanosilica sorbent with nanopolyaniline and crosslinked nanopolyaniline, [Sil-Phy-NPANI] and [Sil-Phy-CrossNPANI]. The images of scanning electron microscopy (SEM) and high resolution transmission electron microscope (HR-TEM) confirmed the immobilization process and particle size in the range of 7.14-23.91 nm. The two novel nano-structured silica composites have been further confirmed and evaluated by determination of surface area, Fourier transform-infrared (FT-IR) study and thermal gravimetric analysis (TGA). The sorption characteristics of [Sil-Phy-NPANI] and [Sil-Phy-CrossNPANI] versus nanosilica were compared toward Cu(II), Cd(II), Hg(II) and Pb(II) ions and investigated by the batch technique in presence of different pH values, contact times, composite dosages, initial metal ion concentrations and interfering ions. The optimum sorption conditions of these metal ions were identified in pH 6.0 or 7.0 as a result of complexation or ion exchange of the metal ions by surface amine and/or hydroxyl groups. The highest metal capacity values of Cu(II), Pb(II), Hg(II) and Cd(II) were characterized in the ranges 1650-1700, 900-1450, 800-1050 and 600-1350 $\mu molg^{-1}$, respectively. Fast equilibrium time was obtained (15-20 min) for sorption of the target metal ions. The sorption behaviors of metal ions by [Sil-