Central composite design of heavy metal removal using polymer adsorbent

ABSTRACT

The industrial effluents of heavy metal become a great concern because of their toxicity. The better design of experimental (DOE) should be applied for an efficient treatment process. The statistical DOE of central composite design (CCD) can be used for the optimization process of heavy metal removal. The cadmium ions (Cd2+) and lead ions (Pb2+) were removed using amidoxime modified poly(acrylonitrile-co-acrylic acid) (poly(AN-co-AA)). The CCD response result (Cd2+ and Pb2+ removal) was obtained by considering independent variables of pH (A), adsorbent dosage (B), and initial concentration (C). The experimental removal of Cd2+ and Pb2+ at optimum conditions was 98.90% and 99.99%, respectively. The regression analysis illustrated the optimum conditions were 10 mg.L−1 Cd2+ concentration with 4.66 g.L−1 adsorbent at pH 9.31, and 20 mg.L−1 Pb2+ concentration with 8.27 g.L−1 adsorbent at pH 9.08. Both of the metal ions yielded insignificant lack of fit of the analysis of variance (ANOVA).

Keyword: Response surface methodology; Central composite design; Quadratic polynomial model optimization; Heavy metal ions