Mesoporous silica from batik sludge impregnated with aluminum hydroxide for the removal of bisphenol A and ibuprofen

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Abstract

The present study reports the removal of Bisphenol A (BPA) and Ibuprofen (IBP) using adsorbents prepared from batik sludge. The calcite sludge-aluminum hydroxide (CAI) adsorbent was prepared by calcination and followed by aluminum hydroxide impregnation. The batik sludge and prepared adsorbents were characterized by FESEM, TGA, XRD, FTIR and BET techniques. The maximum adsorption capacity, adsorption time, different initial solution pH, ionic strength and regeneration study of the adsorbents were also investigated. Furthermore, the sorption behavior of the pollutants were studied by the Langmuir and Freundlich isotherms. The deposition of Al(OH)₃ enhanced the BPA and IBP adsorption capacity on the CAI surface. The maximum removal capacity of BPA and Ibuprofen were 83.53 mg g⁻¹ and 34.96 mg g⁻¹ for the CAI adsorbent. In addition, the kinetic data for BPA and IBP were fitted to the pseudo first order, pseudo second order, Elovich, parabolic diffusion and power function equations to understand the sorption behavior. The adsorption behavior of BPA and IBP was mainly chemisorption. This study shows that CAI is a promising adsorbent for the removal of BPA and IBP.

1. Introduction

Persistent organic pollutants (POPs) are environmental pollutants according to the Stockholm convention, organized by the United Nations Environment Program (UNEP). POPs are not only present in the environment but have long half-lives which could accumulate in the food chain [1,2]. One of the most widespread...