

Abstract

Treatment of drinking water containing fluoride ion requires a robust and an effective technique. This can be achieved by the use of an appropriate sorption material in a fixed-bed filter. Consequently, fluoride adsorption behavior, expressed as breakthrough curve (BTC), has been investigated both in a continuous and intermittent mode of operation, using charged-reversed zeolite particles in a fixed bed filter. The fluoride concentration ranged from 5 to 20 mg/L, typical of what is found in natural systems such as groundwater. In all the fluoride removal experiments, the BTC curves were consistent with the ideal s-shape. A large volume of water was processed for low initial concentration of fluoride, for slow flow velocity, and for bed containing large amount of the sorption media. Equally important, no aluminum was eluted from the zeolite structure, making the sorption media safe for water treatment. A two-parameter logistic model was used to simulate the BTCs. Separately, the fingerprint of intraparticle diffusion was confirmed through operation of the fixed-bed in an intermittent mode.