

Adsorptive Removal of Fluoride by Activated Charcoal and Comparative Study Between Packed Bed and CSTR

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ABSTRACT

The presence of fluoride compounds in the drinking water as well as industrial wastewater causes very toxic effects on human health and aquatic life. The WHO specified the limited concentration of fluoride in drinking and industrial wastewater is less than 1.5 mg/l. If this concentration is more than 1.5 mg/l can lead to dental and skeletal fluorosis and also some very serious health issues in the human body. The various techniques are used for fluoride removals like precipitation and coagulation, electrocoagulation, ion exchange, and adsorption. Most of these techniques are expensive and inefficient. So that effective, modest, and inexpensive technology is of utmost need. Amongst all these techniques, adsorption is very popular due to its cheapness and simplicity in operation. In developing countries, the de-fluoridation by adsorption process is the most favorable, economical, and viable method due to environmentally friendly, and straightforwardness in operation. Many types of adsorbents are available in the environment for fluoride removal. The activated charcoal is a good choice for de-fluoridation because of its microporous structure and having high adsorption capacity. This work seeks the removal percentage for fluoride removal from drinking water by using activated charcoal as an adsorbent. The objective of this work is to perform a comparative study in contactors like packed bed and CSTR for adsorption by activated charcoal. The change in parameters such as influent flow rate, fluoride concentration, agitation speed, pH, reactant concentration, and packing height was experimentally studied. The results indicated that adsorption is a very effective mechanism for fluoride removal and this technique achieved maximum fluoride removal. This study tested the applicability of the adsorption by activated charcoal in an industrial application and the comparison between both reactors.

Keywords: Fluoride; Activated Charcoal; Packed Bed; CSTR; Fluorosis.

