Effect of firing temperature of brick clay on defluoridation

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Chemical properties of brick have been poorly characterized despite its strong ion-exchange properties, which can be used for many applications. Consequently, valuable properties of brick clay, raw or burnt, may not have become useful for chemical and/or industrial processes. Small particles of brick, owing to its ion-exchange and adsorption properties, can effectively be used in an economical and environmental friendly treatment manner for defluoridation. More importantly, increase in temperature of firing brick particles would allow some phase and chemical changes to occur, and hence surface area of brick particles, and nature and extent of processes that depend on surface properties would change with temperature.

The amount of fluoride ions (in μg) adsorbed on a unit mass (1 g) of laboratory fired brick clay samples ($d < 1.0$ mm) varies with the initial concentration of fluoride in solution according to Type I adsorption isotherm for samples fired at temperatures up to 700 °C, above which Type II isotherm is valid. It is proposed that inner sphere complexes between fluoride and surfaces of minerals containing Fe, Al and Si present in brick form up to 700 °C, followed by outer sphere complexes above this temperature. The turbidity of suspensions of low fluoride ion concentrations is very low with brick fired at 300 °C to 600 °C. Moreover, the percent removal of fluoride ions by brick is high at intermediate temperatures followed by a decrease at high temperatures, indicating that brick particles fired at temperatures within the range specified above can effectively be used to defluoridate water contaminated with fluoride.

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