

# **Review of Fluoride Removal from Water by Adsorption using Soil Adsorbents – An Evaluation of the Status**

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## **Abstract**

The fate of excessive fluoride in water is cause for serious public health concerns worldwide. Water defluoridation using various technologies therefore continues to attract disproportionate research interest from around the world. Defluoridation studies using soil adsorbents, in particular, has remained the focus of intense research efforts since the last few decades. So as to assess the research status in this area, soil adsorbents commonly reported for water defluoridation over the last few decades were reviewed. This paper presents a compilation of defluoridation capacities and a summary of requisite parameters for water defluoridation using soil adsorbents. Comparison of defluoridation efficiencies of soil adsorbents is also presented, and the fluoride adsorption kinetics and adsorption equilibrium characteristics of adsorbents discussed. The results indicate that the soil adsorbents that have attracted highest research interest in this regard include: hydroxyapatites, montmorillonites, hydrotalcite, zeolites, pumice and kaolinites. On average, however, the minerals that have shown the highest capacities for water defluoridation are: ferrihydrites, hydrotalcite, palygorskites, boehmite/bauxite, and pumice. Fluoride adsorption for most soil adsorbents are fitted by the Langmuir and Freundlich isotherms. Most of the kinetic data, in contrast, were described by the pseudo-second order kinetics model. Water pH and temperature were the dominant solution factors that controlled fluoride adsorption onto soil adsorbents.

**Keywords:** Adsorption; Defluoridation; Drinking water; Fluoride; Literature review; Soil adsorbents