

## **Application of cryptocrystalline magnesite-bentonite clay hybrid for defluoridation of underground water resources: implication for point of use treatment**

V. Masindi

### **Abstract**

A new synthesis method was established to fabricate a nanocomposite material comprising of cryptocrystalline magnesite and bentonite clay that has high adsorption capacity for ionic pollutants. To synthesize the composite at 1:1 weight (g): weight (g) ratio, a vibratory ball mill was used. Batch adsorption experiments were carried out to determine optimum conditions for fluoride adsorption. Parameters optimized included: time, dosage, concentration and pH. Optimum conditions for defluoridation were found to be 30 min of agitation, 0.5 g of dosage, 0.5:100 solid to liquid (S/L) ratios and 25 mg L<sup>-1</sup> of initial fluoride ions. Fluoride removal was independent of pH. The adsorption kinetics and isotherms were well fitted by pseudo-second-order and Langmuir models, respectively indicating chemical and monolayer adsorption. Findings illustrated that the newly synthesized adsorbent was a promising adsorbent for the environmental pollution clean-up of excess fluoride in underground water and it can be used as a point source treatment technology in rural areas of South Africa and other developing countries.