

## **Ferrous saponite from the Deccan Trap, India, and its application in adsorption and reduction of hexavalent chromium**

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### **ABSTRACT**

A green-colored clay mineral occurring on the walls of amygdaloidal cavities and along fractures in the Deccan flood basalts at Killari, Maharashtra, India has been identified as iron-rich saponite, with chemical composition  $(\text{Na}_{0.60}\text{K}_{0.04}\text{Ca}_{0.47})(\text{Mg}_{2.05}\text{Fe}_{3.95}^{2+})(\text{Si}_{6.45}\text{Al}_{1.55})\text{O}_{20}(\text{OH})_4$ . The XRD data of the Killari sample with  $d(001) = 1.70$  nm and  $b_0 = 0.9275(2)$  nm conform to that of ferrous saponite. The FTIR spectra show vibrational bands typical of trioctahedral smectites. Differential thermal and thermogravimetric analyses show strong endothermic peaks due to dehydroxylation at 390–420 and 1070–1130 K accompanied by weight losses of 17 and 2.3 wt%. A weak exothermic peak at about 1220 K is also observed. These peaks are characteristic of smectites. <sup>29</sup>Si and <sup>27</sup>Al MAS NMR studies show that silicon and most of the aluminum in the clay mineral are in fourfold coordination. We have demonstrated for the first time the usefulness of ferrous-saponite in reduction of hexavalent chromium. X-ray photon electron spectroscopic (XPS) studies of the fine clay sample treated with dichromate solution show that this ferrous saponite has the capability of adsorbing and reducing hexavalent chromium to the trivalent state.