Study on the structural changes occurred during the acid activation of Gharenaz bentonite as bleaching earth

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(Received:10/8/2006, in revised form:24/6/2007)

Abstract: Gharenaz bentonite contains montmorillonite as the major mineral constituent and Ca as the major exchangeable cation. In the present study, the structural changes occurred in the course of acid activation of this bentonite was investigated by chemical analysis using ICP-AES and phase analysis using XRD methods. Chemical analysis showed that most of the exchangeable cations i.e. K+, Na+ and Ca²⁺, can be dissolved at low acid concentration whereas the dissolution of the octahedral layer cations, i.e. Mg²⁺, Fe²⁺ and Al³⁺, depends on the acid concentration. The acid treatment experiments on Gharenaz bentonite by sulfuric acid showed that removal of octahedral cations increases as the acid concentration raises up to 3 normal after which, it remains almost constant. However a further increase in the dissolution of these cations was observed at the acid concentrations more than 5 normal. XRD analysis of the activated samples indicated, i) the elimination of calcite mineral even at low acid concentration. ii) the formation of calcium sulfate (gypsum) and iii) decrease in the intensity of (001) peak of montmorillonite during the activation process, due to the partial destruction of the octahedral layers. In order to evaluate the optimum structural changes, the activated samples was used in bleaching of an edible oil. The results showed that the bentonite activated at 3 normal is most efficient in the bleaching process.

Keywords: bentonite, montmorillonite, acid activation, structural changes.