Characterization and Beneficiation of Montmorillonite in Clay Deposits, Murunkan, Sri Lanka

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Montmorillonite is by far the most abundant of the smectite clay minerals. Montmorillonite clay is commonly used in drilling, mineral processing, pharmacological and agrochemical applications. Montmorillonite deposits elsewhere in the world are commonly formed as a weathering product of volcanic ash. In Sri Lanka although such deposits are absent, montmorillonite-rich clay occurrences can be found in arid regions. Murunkan is an area which is composed of soil with higher montmorillonite content.

Clay samples were collected from 7 boreholes drilled within the Murunkan basin. The grain size analysis showed the fine fraction (<63 μm) from 85% to 30% averaging at 46%. X ray diffraction (XRD) analysis, Differential Thermal Analysis (DTA) and Thermal Gravimetric Analysis (TGA) revealed the presence of montmorillonite in all the samples.

During the beneficiation process, the coarse fraction (>63 μm) was separated by wet sieving. The impurities in the finer fraction were identified by XRD analysis. The major impurity identified was quartz. Sedimentation technique was used to minimise quartz content and beneficiation of montmorillonite rich portion in the fine fraction. After suspending the finer fraction in water, the aliquot was pipetted out at different settling times and constituents were analysed using XRD. The results revealed a rapid increment of montmorillonite up to 60 minutes, and thereafter a fluctuation of montmorillonite/quartz ratio. The most appropriate time to decant the suspension was found to be after 60 minutes. The 180 minutes settling time was selected as the most suitable decanting time.

The purified montmorillonite rich fraction was compared with commercially available bentonite. The swelling capacity was tested by adopted ASTM D 5890 method. It showed 24.5 ml/2 g for commercial bentonite and 10 ml/2 g for purified Murunkan clay. According to the chemical analysis of purified fraction and commercial bentonite, comparable SiO_2 and Al_2O_3 content were present in both samples. In addition, Fe_2O_3 content was low in purified Murunkan clay while MgO and CaO contents were nearly similar.

Further beneficiation should be done for the purified fraction depending on the application to be used. The swelling capacity is not reached to the level of commercial bentonite. The activation processes are needed for raising the swelling capacity.