

Yield strength and viscosity of kaolinite-montmorillonite-water system

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We analyzed yield strength and viscosity of kaolinite halloysite and montmorillonite under different water contents. These minerals are common clay minerals in surface soils, weathered volcanic ash layers and shallow level hydrothermal alteration zones. The experiments are performed by stress control mode using rheometer (Brookfield RST Rheometer)

The yield strength of montmorillonite decreases from 20000 Pa to 1000 Pa as increasing water contents from 100 % to 800 %. That of kaolinite decreases from 4000 Pa to 200 Pa as increasing water content from 50 % to 90 %. That of halloysite decreases from 12000 Pa to 500 Pa with increasing water content from 50% to 120 %. 800 %, 50 % and 120 % are consistent with liquid limits of monmorillonite, kaolinite and halloysite respectively. Halloysite and kaolinite are weaker than montmorillonite since montmorillonite has more exchangeable cations than the other minerals. Halloysite is stronger than kaolinite because of its tube-like crystal habit and incorporation with interlayer water.

We also conducted the same experiments using kaolinite-montmorillonite mixture. Yield strength of kaolinite remarkably increases with increasing montmorillonite fraction. Kaolinite (20%)- montmorillonite (80%) mixture has almost the same yield strength as pure montmorillonite.

Keywords: Clay-water system, Kaolinite, Halloysite, Montmorillonite, Mixture