Feasibility Study for Precise Particle Characterization of Fine Clay Particle Using An Automated Particle Image Analysis and Nanotrakcking Analysis.

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Introduction

Clay minerals are very common in soils, in fine-grained sedimentary rocks such as shale, mudstone, and siltstone and in fine-grained metamorphic slate and phyllite. Typical mechanism to generation of clay is alteration of the surface on mineral rock due to affected by transfer of water on the earth surface. Behavior of generation of clay is controlled by surface of minerals be forced to transform to other mineral component due to the moment contact with water. Particle size of clay minerals are usually ultrafine-grained, such as normally considered to be less than 2 micrometers in size on standard particle size distributions. Notable properties of clay are high-affinities with water, minerals due to unique properties of possible to make intercalation in crystal structure, and possibly disperse to anywhere with moving of water on earth surface due to fine particle size range. Therefore, to understand characteristics of clay is possible to consider as a maker index parameter of material transportation on the surface of earth. Especially particle characterization of clay is promising as fundamental parameter. Existing approaches to characterize of particle are such as an electron microscope (Scanning type: SEM, Transmission type :TEM) , an optical microscope (OM) , a laser diffraction (LD), an electro zone methods (coulter counter) and a dynamic light scattering (DLS) . However, drawbacks of these methods were such as indirect method, limited work on concentration determination, time consuming to measure over than several thousand particles and requirement to highly concentration (over than 3wt%) of ionized water. Complementally analytical approach using an automated particle image analysis (APIA) and Nanotracking analysis (NTA) are promising tools to as new flamework. In this report will be discuss for feasibility and technical discussion to applicable for fine clay using this flamework.

Material and Methods.

As model samples for clay mineral, purchased Kaolin was used. To investigate purity and chemical components using crystal structure , XRD (Aereris , MalvernPanalytical , Almero, Netherlands) was used. Profile of XRD chart suggested diffraction peaks on 9.6, 19.3, 19.9, and 29.1 degrees. These peaks were significantly suggested as Pyrophyllite using library search.To characterize micrometer particles range, APIA analyses were conducted on a Morphologi G3SE as automated image analysis system (MalvernPanalytical Instruments, Worcestershire, UK). To characterize nanometer range, NTA analyses were conducted on a NS300 as nanotracking analyzing systems (MalvernPanalytical Instruments, Worcestershire, UK) with particle concentration.

Keywords: Clay Minerals, Particle Morphology, Particle Charactarization