[JJ] Evening Poster | M (Multidisciplinary and Interdisciplinary) | M-TT Technology & Techniques

[M-TT37]Frontiers in Geochemistry

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Many new findings in earth and planetary sciences have been obtained by using state-of-the-art techniques supported by new technical development in analytical chemistry. This session aims at providing an opportunity for those developing new analytical methods to get together and have a strategic discussion on frontiers in geochemistry and cosmochemistry. We welcome a wide range of cutting-edge geochemical topics based on technical development, which have a potential for breakthrough of earth and planetary sciences. Besides, topics related to the direction of geochemistry and cosmochemistry in future are also welcome. Especially, we welcome topics which present how to install/maintain precious facilities in geochemical laboratories. We expect wide-ranged and future-oriented discussion to develop geochemistry and cosmochemistry.

[MTT37-P06]Fundamental evaluation of particles including statistical particle image analysis method for preparation of seabed floc simulation sample

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1. Introduction

Flock is an aggregate in which fine particles such as clay and silt gathered loosely. It exists in the seabed for example. Research on flocs has been carried out on site and/or real samples, and many are observational approaches. We tried analysis from a micro viewpoint for making floc simulation samples. Specifically, simulated samples of flocs were prepared and the relationship between the characteristics of the raw material particles and simulated samples was analyzed.

First of all, the particle size distribution(PSD) is very popular as a particle analysis. The typical method is laser difraction(LD) and sieve, and both methods are very useful for bulk evaluation. But they are not suitable for analysis of individual particles. In addition, the result is based on volume(weight) and it is often difficult to discuss the proportion of fine particles.

The particle shape analysis is also familiar approach. A microscopy method has been used for this. But this method was difficult to get sufficient number data.

A Statistical Particle Image Analysis(SPIA) is a useful method to solve these problems. This method is based on ISO 13322. Particle projection images are used as raw data and each image is analyzed in real time with a computer. The sensitivity of fine powder is high and it is possible to analyze a statistically significant number of particles.

In this report, the basic analysis of the particles morpholory is carried out with mainly SPIA method, and the effect of the particle characteristics on the formation of flocs is discussed.

2. Material and method

As model samples, kaolin(sample1), pyrophyllite(sample2) and Tohoku FineSand(sample3) are used, and

Eb-a(Hayashi Co., Ltd.) is used as a flocculant for simulated floc preparation. A simulated floc sample was prepared by adding 1 drop of 10% Eb-a water solution to each 0.02% sample water solutions.
A SPIA system(MorphologiG3, Malvern Instruments) was used to evaluate of particle size and shape. The observation mode was diascopic mode(Transmittance mode) and magnification was 1,000x in total. The sample was dispersed with SDU(Sample Dispersion Unit) which attached to Morphologi G3. Number of measured particles was 50,000 and a parameter filter function on the software was used based on shape and pixel number of particle image.
For PSD of each raw material and floc particle size measurements in a wet environment, LD size analyzer Mastersizer 3000(Malvern Instrument) HydroMV was used.

3. Result
In general, in dry powder, it is known that the cohesion force increases geometrically as the particle size decreases and aggregation is likely to occur when the shape becomes distorted. Although it is a wet process in this study, first attention was focused on particle size and shape as a fundamental particle morphology analysis.
At the CED based on the number, no significant difference was observed in the PSD width, but differences were observed on the fine particle side. For example, the proportion of particles smaller than 1um was sample3(5.3%), sample2(9.6%) and sample1(11.2%).
In terms of circularity as a shape comparison, the median(Dn50) was sample1(0.84), sample2(0.87) and sample3(0.89). The same trend was obserbed in the aspect ratio. This result indicates that sample1 is the most distorted, sample3 has the shape closest to the circle. From the morphological analysis of the particles, the smallest amount of fine particles and the closest to exact circle was sample3. This suggests that sample3 is most difficult to aggregate and to form flocs.
In terms of compearing ease of floccing, the ratio of Dv50 floc to Dv50 raw material was sample3(2.1), sample2(4.4) and sample1(5.4).
The result of zeta potential was also obtained and will be disscussed on that day about this as well.

4. Conclusions
The results indicates that the proportion of fine particles and particle shape are also related to Floc formation. Measurements with imitating actual seawater will give more interesting results.