

Fundamental evaluation for making simulated sea bed floc

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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. There we tried analysis from a micro viewpoint for making floc simulation samples and reported about relationship between sample particle feature and how ease to be floc last year.

But we didn't care flocculant concentration in that report. Flocculant concentration must be important factor to discuss with making a simulated floc. Therefore we focused on influence of flocculant concentration to floc characteristic in this study.

2. Material and method

Kaolin as a model sample and Eb-a(Hayashi Co., Ltd.) as a flocculant for simulated floc preparation were used. Eb-a water solution concentration was 0%, 0.1%, 0.01%, 0.01% and 0.0001%. 0.05% sample water solution was prepared with each Eb-a water solution.

One of famous parameter of solution stability evaluation is zeta potential. Zeta potential was measured with Zetasizer nano ZSP (Malvern Instruments). Particle size distribution (incl. floc size distribution) was measured with Mastersizer 3000 (Malvern Instruments) which is laser diffraction system. Mastersizer 3000 is circulation system. In other hand, Morphologi 4 (Malvern instruments) which is a statistical particle image analysis system was also used for measuring particle size distribution. Morphologi 4 is not circulation system, so we can know original floc size distribution and we can see floc as well because Morphologi 4 is imaging system.

3. Result

Zeta potential in each flocculant concentration is shown in Table 1. In general, the system is stable when the zeta potential absolute value is over 20mV. Zeta potential in Eb-a concentration 0%, 0.001% and 0.0001% were around -60mV. It means that these systems are very stable and it indicates that it is difficult to occur flocculation in these situations. In the other hand, zeta potential absolute value in Eb-a concentration 0.01%, 0.1% and 1% were under 10mV, so that these indicate easy to occur flocculation. The floc size measured by Mastersizer3000 is shown in Table 2. At The size was measured with 1500rpm/stirring speed at first, then was measured with change to 2500rpm/stirring speed. Comparing each Dv90 on 1500rpm, higher Eb-a concentration showed bigger floc size. In terms of toughness of floc, comparing the ratio of Dv90 on 1500rpm to Dv90 on 2500rpm was 1% Eb-a (0.54), 0.1% Eb-a (65%) and 0.01% Eb-a (75%). This is a result indicating that 0.01% Eb - a was the least fragile among these three samples. Also interestingly, Dv10 on 2500rpm was 0.01% Eb-a (18um), 0.1% Eb-a (9.6um) and 1% Eb-a (5.1um).

The floc size was measured by Morphologi 4 as well. These data will discuss indetail on that day.

4. Conclusions

The results show flocculation concentration is one of important factor to make simulated floc. We will continue to study to make clear which factor important to make simulated floc.

Keywords: floc, flocculation, zeta potential, particle size distribution, imaging

Eb-a(%)	0	0.0001	0.001	0.01	0.1	1
Zeta Potential (mV)	-58.0	-59.4	-57.9	-9.62	-1.03	0.119

Table 1: Zeta potential in each flocculant concentration

Eb-a(%)	stirre speed	Dv10(μ m)	Dv50(μ m)	Dv90(μ m)
1	1500rpm	14.6	62.5	155
1	2500rpm	5.06	25.0	83.3
0.1	1500rpm	12.4	42.4	106
0.1	2500rpm	9.64	30.3	68.5
0.01	1500rpm	19	45.2	87.6
0.01	2500rpm	17.6	36.3	65.6
0	1500rpm	2.69	6.11	14.9

Table 2: Floc size