Effects of Container Height on The Sedimentation Behavior of Flocculated Suspension of Na-Montmorillonite

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I. Introduction

Sedimentation behavior of flocculated suspension can be regarded as one of the fundamental issue in the transportation of cohesive sediment. However, it is notoriously known that the size of container will be strongly affected. In the present study, we focus on the moving velocity of interface between sediment and supernatant that is observed in the semi-dilute regime which is characterized by an extremely slow movement of interface followed by an abrupt settling and ending into consolidation[1,2]. Among these properties, we confirmed the maximum settling velocity monotonously increases with the height of sediment.

Figure 1. Picture of Experimental Set Up

II. Material and Methods

Na-Montmorillonite slurry with ϕ : 2.0×10^{-4} was prepared from Kunipia-F saturated with 1.0 M sodium chloride. Two diameter of settling tubes 4.0 cm and 2.0 cm were tested. The initial height of suspension varied from 13 cm to 50 cm. Flocculated suspension of Montmorillonite were left to settle down in cylinders after manually mixed by end over end. Changes in the height of interface between the flocculated suspension part and the clear supernatant measured as a function of time.

III. Results and Discussion

An initial latency period appear at first followed by a time of rapid settling rate demonstrating an inverse S curve (Fig.2)[1,2]. The slope of settling stage, denoting the rate of sedimentation was not constant but varied for different height. The slope becomes steeper as the initial height of slurry increases. The consolidation stage appears in the end of this stage.

Figure 3 represent the settling rate as a function of elapsed time. As demonstrated in the figure, the maximum rate appears at certain period. The value was confirmed to increase with an increase of sediment height. This tendency was summarized in Figure 4.

IV. Conclusion

1. The container height affect the movement of flocs in the settling stage.
2. The maximum velocity rate increase proportional to the height of container.

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VI. Reference

1. Michaels, A.S. and Justin, C.B. 1962. Settling Rate and Sediment Volumes of Flocculated Kaolin Suspensions. I & EC Fundamental. Vol. 1 No. 1 February 1962.
2. Imai, G. 1981. Experimental Studies on Sedimentation Mechanism and Sediment Formation of Clay Materials. Soil and Foundation. Vol. 21 No. 1 Mar. 1981. Japanese Society of Soil Mechanism and Foundation Engineering

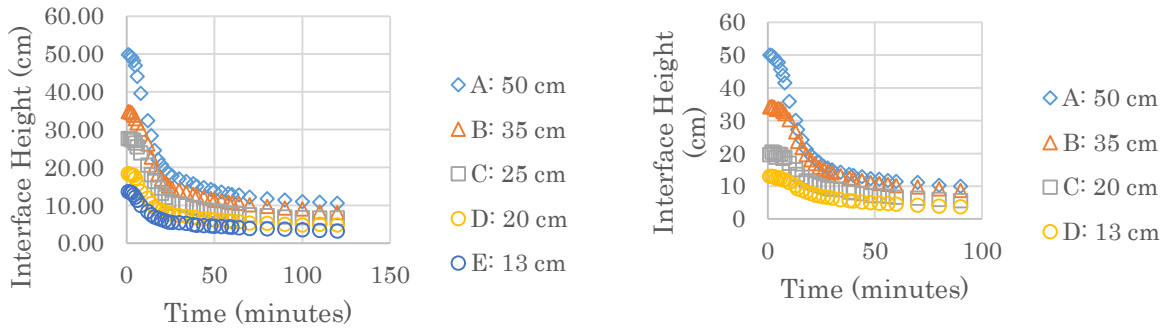

Figure 2. Interface Height as Function of Time at diameter of 4.0 cm and 2.0 cm

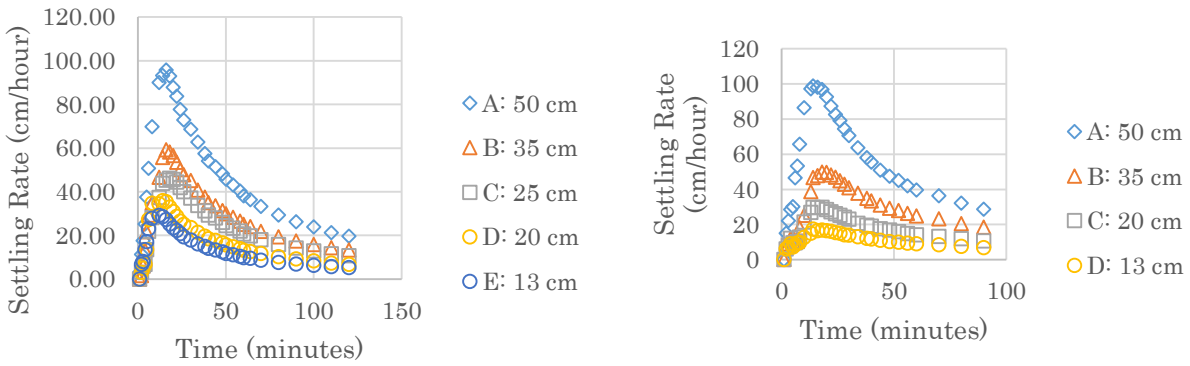

Figure 3. Settling Rate as Function of Time at diameter of 4.0 cm and 2.0 cm

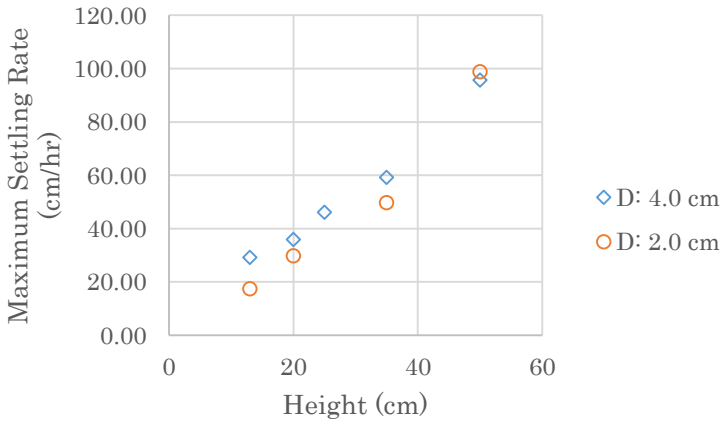

Figure 4. Maximum Settling Rate as function of Height

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