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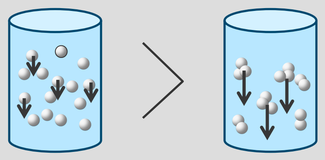
# The effect of applied electric field conditions on the aggregation of particles in aqueous slurries

Hosei Univ. (Student) Nagashima Hirotaka, Era Yusuke, (Regular) Mori Takamasa

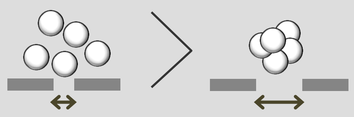
## Introduction

By forming aggregates,
the efficiency of solid – liquid separation can be improved.

ex.1 sedimentation thickening

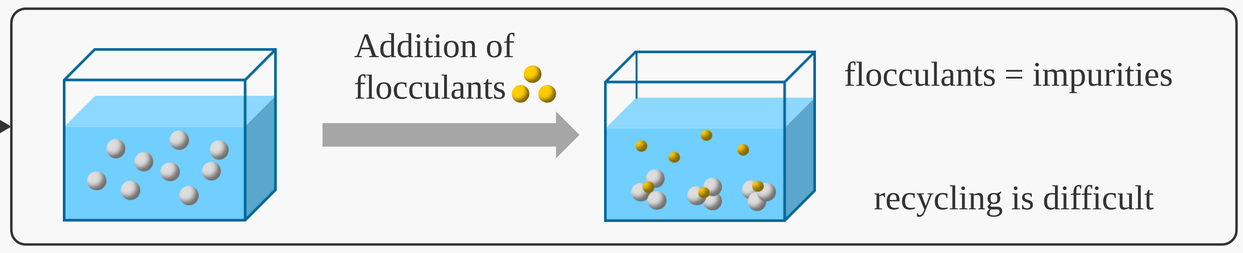


ex.2 filtration



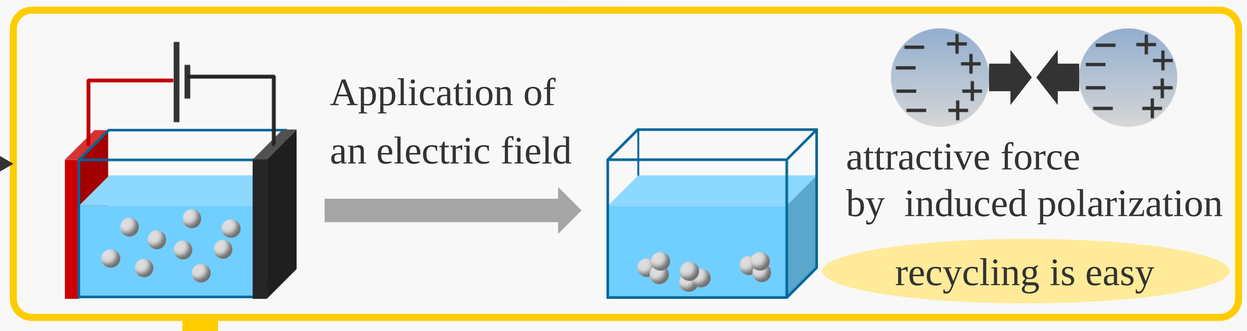
- quick separation
- cost reduction

**The conventional method** ・・・ using flocculants




**However** in order to **recover** and **recycle** fine particle in the liquid

**This research** using an electric field




In this paper we discussed how **the distance** between two electrodes and **the applied voltage** affect on particle aggregation.

## Experiments

| | |
|---|---|
| **powder** | alumina (AES-12), average particle size = 0.48 μm |
| **dispersion medium** | deionized water |
| **pH adjustment agent** | nitric acid , aqueous ammonia solution |

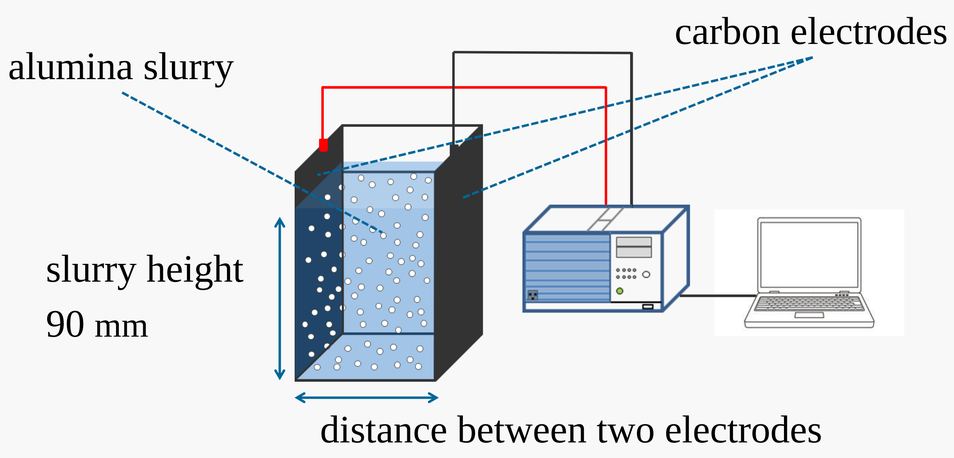



**Fig.1 the experimental device**

**Table 1 the slurry conditions**

| particle concentration [vol%] | pH [-] |
|---|---|
| 0.1 | 3.4 ~ 3.5 |
| | 7.0 ~ 7.2 |
| | 8.8 ~ 9.0 |
| | 10.4 ~ 10.5 |

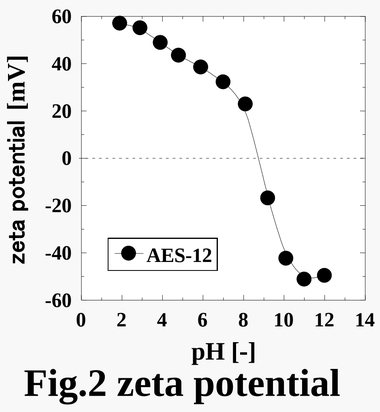



**Fig.2 zeta potential**

**Table 2 the applied electric field conditions**

| electric field strength [V・m$^{-1}$] | 125 | | | |
|---|---|---|---|---|
| distance between two electrodes [mm] | 40 | 60 | 80 | 100 |
| voltage [V] | 5.0 | 7.5 | 10.0 | 12.5 |

## Results and Discussion

■ observation of interface between supernatant and slurry layer

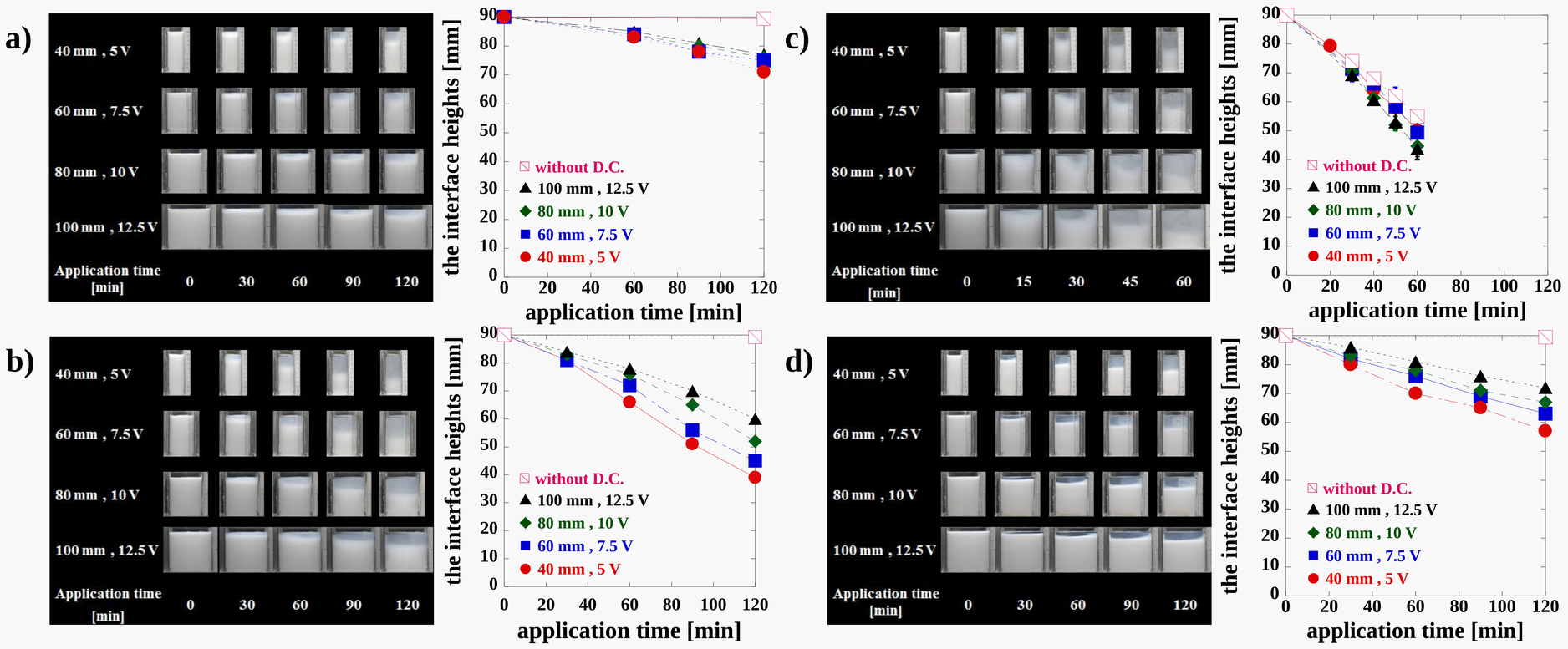



**Fig.3 the change of the interface heights a) pH 3.5 , b) pH 7.0 , c) pH 8.8 , d) pH 10.5**

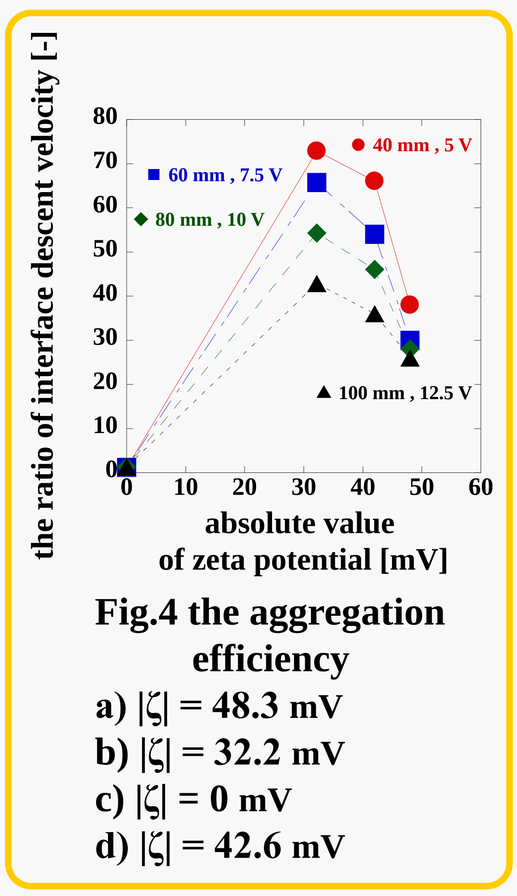



**Fig.4 the aggregation efficiency**
**a) |ζ| = 48.3 mV**
**b) |ζ| = 32.2 mV**
**c) |ζ| = 0 mV**
**d) |ζ| = 42.6 mV**

## Conclusion

■ In the particle aggregation using D.C. electric field, **decreasing the distance** between two electrodes is more effective than applying high voltage at the same electric field strength.

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**Address** : 3-7-2 Kajino-cho, Koganei City, Tokyo, Japan Hosei Univ. Koganei campus E-4001 Mori Lab. **E-mail** : hirotaka.nagashima.6y@stu.hosei.ac.jp **Tel** : 042-387-6161