

Research Topic	Liquid marble formation using PPy-coated PET plates	Graduate School of Engineering
Host University	The University of Newcastle / New South Wales / Australia	Applied Chemistry, Environmental and Biomedical Engineering
Duration	From August 17 to September 23, 2019	FUJIWARA Junya

Summary of the Research Activities

Liquid marbles (LMs) are small droplet encapsulated by hydrophobic particles. LMs are generally prepared by rolling liquid droplets over a hydrophobic particle bed. The most of reported stabilizer are spherical or undefined, and the most of LMs are spherical or ellipsoidal. Recently, it has been reported that the polyhedral LMs can be prepared by using hydrophobic hexagonal PET plate as a stabilizer (Fig. 1). Polyhedral LMs were also prepared using a rolling method. Recently, an electrostatic formation method has been researched as a method of preparing LMs different from a rolling method (Fig. 2). This is a method of preparing LMs by transporting particles across an air gap to a pendent droplet in the presence of an electric field.

In this study, we attempted to prepare LMs stabilized with 0.2, 1, 2 mm-sized hexagonal PET-PPy-CI plates or PET-PPy-C₈F plates using an electrostatic formation method. Fabrication of LMs stabilized with 0.2 mm-sized PET-PPy-C₈F plates were attempted using an electrostatic formation method. The result showed that the edge of plates adsorbed to pendent droplet surface (Fig. 3). When the electrostatic formation method was performed using 0.2 mm-sized PET-PPy-CI plates, the surface (not edge) of the plates were adsorbed to the pendent droplet surface (Fig. 4). From these results, it became clear that the shape of LMs prepared by rolling method and electrostatic formation method are different. In addition, an electrostatic formation method was performed using PPy-coated PET plate of each size. The distance between the bottom of pendent droplet and plate bed when the plate first jumped was measured (Fig. 5, 6). As the size of plate increased, the distance increased. Through this study, we succeeded in preparing LM with unique shapes that were not found in conventional LMs.



Fig. 1 Polyhedral LM prepared by rolling method

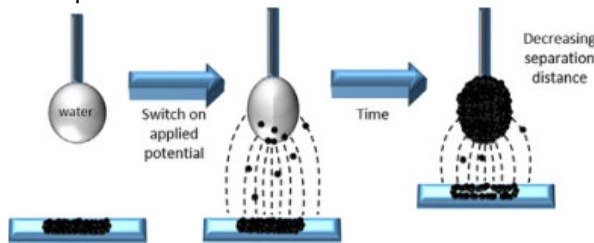


Fig. 2 Fabrication of LM by electrostatic driven process

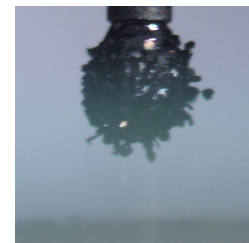


Fig. 3 The LM stabilized with 0.2 mm-sized PET-PPy-C₈F plates prepared by electrostatic driven process

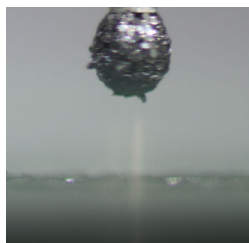


Fig. 4 The LM stabilized with 0.2 mm-sized PET-PPy-CI plates prepared by electrostatic driven process

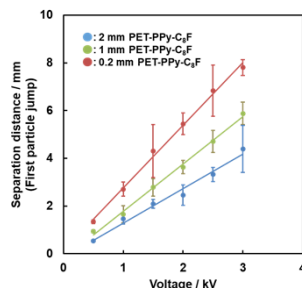


Fig. 5 Relationship between separation distance of first particle jump and voltage.

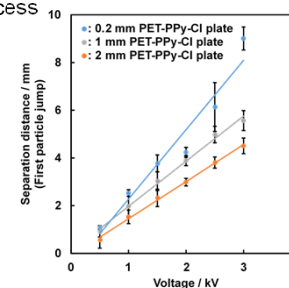


Fig. 6 Relationship between separation distance of first particle jump and voltage.

My life in Australia

I stayed The University of Newcastle in Australia for about two months. The University of Newcastle is in forest and the scenery inside the university is very beautiful. The lab members were very kind and my life in Australia was very enjoyable. I went to the zoo on weekend with Ben (lab member) and his wife, and then to went to a restaurant. We ate delicious bread at the restaurant and drank beer. This experience is very fun and a good memory. There are many other good memories. Through this study abroad, I felt that study abroad was a very good experience.



指導教員講評

ニューカッスル大学への短期留学を通じて何事にも自ら率先して行う能力が身についたと感じられます。今回の留学で得られたことを活かし、今後の発展を期待します。

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