**Mechanism of stratification in the drying process**

**of bi-disperse colloidal film**

**Jae Hwan Jeong, Young Ki Lee, and Kyung Hyun Ahn\***

*School of Chemical and Biological Engineering,* *Seoul National University, Seoul, 08826 Korea*

Presented at the 20th International Coating Science and Technology Symposium

September 20-23, 2020

Minneapolis, MN, USA

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**Extended Abstract:**

Drying of colloidal films is encountered in many technological fields, including latex painting, inkjet printing, and battery electrodes, to list a few. The major concern in these systems is how to control the distribution of the components such as colloidal mixtures and additional binders during drying. Recently, the formation of a stratified layer by small particles has been reported for the colloidal mixtures of different sizes. This phenomenon has attracted attention due to the uniformity issues within the film or due to the practical application of the multi-layer coatings. To analyze the stratification of colloidal mixtures, several simulation studies have been carried out, but they mainly focused on finding the drying conditions of the stratification. In this work, we perform Brownian dynamics simulation to understand the stratification mechanism of the bi-disperse colloidal film in drying. We first focus on the morphological change of the film during drying for particle size ratios and evaporation speed. The stratified layer is more pronounced for higher Péclet numbers and large size ratios of particles. The results are qualitatively matched well to the reports. As next, we analyze the normal stress behavior in drying film. When the stratification does not occur, the normal stress differences across the film develop an initial increase and then reach a plateau. In contrast, with occurring stratification, the normal stress differences once reach the maximum value and then decrease followed by a drastic increase. Finally, the evolution of the local microstructure is quantified and is related to the normal stress response. Normal stress and microstructure analysis guide us to demonstrate the mechanism behind the stratification.