

Stratification in Drying Film of Polymer–Colloid Mixtures via Controlled Entanglement of Adsorbed Polymers on a Colloid Particle

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The drying of a polymer–colloidal film is important in many areas, such as in printing, spreading and coating, and materials science. An important problem is the structure of dried film, which has a great effect on material properties, is largely dependent on drying conditions. In case of two different size of colloidal mixtures, it is well known that the colloids often stratify, where small colloids are laid upon large colloids at the very strong evaporation condition. Also, the similar polymer–on–top stratification of polymer–colloid mixtures, where the size of polymer is much smaller than the size of colloid, has been reported by simulation. However, there have been no experimental studies for the polymer–colloid mixtures yet. Here, we show that the stratification phenomenon can be controlled by modulating the entanglement between colloid–adsorbed polymers in experimental study. From rheological measurement, we find the evidence of entanglement of colloid–adsorbed polymer at the drying interface for non–stratified films, while there are no entanglement characteristic for stratified films.