Impact of the Marangoni effect on the thin film thickness profile after drying polymer solution coated on a flat substrate

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Drying process of polymer solution coated on a flat substrate is very important in various industrial applications, such as fabricating flat polymer thin film, inkjet printing and so on. Though previous studies about fabrication of flat polymer thin film discussed mainly time-variation of a polymer liquid film’s thickness during drying, spatio-temporal variation of concentration distribution in a polymer solution liquid film as discussed in our study was not discussed.

We have proposed and modified a model of drying process of polymer solution coated on a flat substrate for flat polymer film fabrication. And we have clarified dependence of distribution of polymer molecules on the substrate on various parameters based on analysis of numerical simulations of the model [1].

Because it is assumed that coated solution film on a flat substrate is very thin and therefore Marangoni number is small enough, it is thought that Marangoni convection does not occur. However it is thought that there is some sort of Marangoni effect. In this study, we add Marangoni effect as pseudo-negative diffusion on an upper gas-liquid interface to the model. Then we evaluate effects of the Marangoni effect in the drying process through numerical simulation.


Dependence of solute's distribution near the edge on Marangoni effect.