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The model that takes the Marangoni effect into account for drying process of polymer solution coated on a flat substrate HIROYUKI KAGAMI, Department of Preschool Education, Nagoya College — We have proposed and modified a model of drying process of polymer solution coated on a flat substrate for flat polymer film fabrication supposing resist coating process in photolithography process. And we have clarified dependence of distribution of polymer molecules on a flat substrate on various parameters based on analysis of many numerical simulations of the model. Then we applied the model to thickness control of a thin film after drying through thermal management. Above model consists of two elements. One is vaporization at the gas-liquid interface. The other is the diffusion inside the liquid film on a substrate. The diffusion is divided into two kinds of diffusion, that is, diffusion of solvent with solutes due to gradient of the number density of particles per space and diffusion of diffusion of concentration of solution. Because it is assumed that coated solution film on a flat substrate is very thin and therefore both Rayleigh number and Marangoni number are small enough, it is thought that Bénard convection or Marangoni convection does not occur and therefore it is sufficient to consider only above-mentioned two kinds of diffusion inside the liquid film. However it is thought that there is some sort of Marangoni effect regardless Marangoni convection does not occur. Therefore, in this study we add the Marangoni effect to the existing model. Then we evaluate effects of the Marangoni effect in the drying process through numerical simulation of the modified model.

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