Abstract Submitted
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Electrostatic-directed deposition of nanoparticles on a field generating substrate[1] TAKUMI HAWA, DEHAO TSAI, University of Maryland and National Institute of Standards and Technology, RAYMOND PHANEUF, University of Maryland, MICHAEL ZACHARIAH, University of Maryland and National Institute of Standards and Technology — In this paper we develop a Brownian dynamics model applied to position metal nanoparticles from the gas phase onto electrostatic-patterns generated by biasing P-N junction substrates. Brownian motion and fluid convection of nanoparticles, as well as the interactions between the charged nanoparticles and the patterned substrate, including electrostatic force, image force and van der Waals force, are accounted for in the simulation. Using both experiment and simulation we have investigated the effects of the particle size, electric field intensity, and the convective flow on coverage selectivity. Coverage selectivity is most sensitive to electric field, which is controlled by the applied reverse bias voltage across the p-n junction. A non-dimensional analysis of the competition between the electrostatic and diffusion force is found to provide a means to collapse a wide range of process operating conditions and an effective indicator or process performance.

[1]NSA

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