Advanced Process Control of the Critical Dimension in Photolithography

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Abstract

This paper describes two run-to-run controllers, a nonlinear multiple exponential-weight moving-average (NMEWMA) controller and a dynamic model-tuning minimum-variance (DMTMV) controller, for photolithography processes. The relationships between the input recipes (exposure dose and focus) and output variables (critical dimensions) were formed using an experimental design method, and the photolithography process model was built using a multiple regression analysis. Both the NMEWMA and DMTMV controllers could update the process model and obtain the optimal recipes for the next run. Quantified improvements were obtained from simulations and real photolithography processes.

Keyword：Run-to-run (R2R) controller, Nonlinear multiple exponential-weight moving-average controller,
Dynamic model-tuning minimum-variance (DMTMV) controller, Photolithography process