

# Run by Run Process Control of Metal Sputter Deposition: Combining Time Series and Extended Kalman Filter

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## Abstract

By the time series model, this paper constructed the disturbance model for the aluminum sputter deposition process and derived the extending Kalman filter (EKF) controller based on this new disturbance model. Experimental results reveal that  $ARI(3,1)$  model appropriately characterizes the dynamic behavior of the disturbance for the processes. The EKF controller which includes information of process noise and measurement noise is able to regulate the model coefficients automatically as the target is replaced or degrades. In this paper, the d-EWMA controller, time-varying d-EWMA controller, age-based d-EWMA controller, and EKF controller have been applied to aluminum sputter deposition processes for predicting deposition rates and comparing their performances. The application of the EKF controller here is proven to improve the estimating accuracy of the aluminum sputter deposition process significantly, regardless of whether the deposition rates are measured at each run or not.

Keyword : d-EWMA controller, deposition rate, extended Kalman filter, time series model, time-varying d-EWMA controller.