J. Vac. Sci. Technol. 6, 6, pp.2234-2237 (1988)

Resist development described by least action principle line profile prediction

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ABSTRACT

A new idea is introduced requiring that each development path will be the path of least resistance to developer penetration. Consequently, minimum dissolution time is required for the development of the final line profile. This idea manifests itself in a variational calculation of the path integral along each local development trajectory, from which the dissolution profile is obtained uniquely, as a solution of a nonlinear partial differential equation (PDE). The photoactive compound (PAC) concentration is obtained from the standard Dill's equations for the exposure bleaching process for both monotonic as well as standing waves. The procedure has been implemented and tested. It has been found to be very accurate and it eliminates the path crossings inherent in the predictions of the string algorithm. The arbitrary elimination of unfavorable points is avoided as well for all developing times.