

Calculation of image profiles for contrast enhanced lithography

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ABSTRACT

Simultaneous bleaching of a contrast enhancing film (CEF) and the underlying positive photoresist is considered in the absence of any interface or substrate reflectivity. The intensity transmitted by the CEF is determined as a function of exposure time exactly using the absorptivity of the film in Dill's model equations. Corresponding to this time dependent transmitted intensity, the concentration profiles in the positive photoresist have been expressed exactly in closed form. Relations, that implicitly define the developed image profile, are derived assuming that the resist development can be approximated by a two state process. Furthermore, they are solved numerically for a polysilane AZ 2400 resist system and a model CEM 388-resist combination proposed by Mack (1987). The predicted image profiles are in excellent agreement with the experimentally determined profiles of PROLITH for the model system of Mack.