Latent Image Analysis of Chemically Amplified Resist Formulation via Fluorescence Spectroscopic Imaging  

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Description:

We now provide new methods for analysis of photoresist coating layers. Preferred methods of the invention include fluorescence microscopy inspection of an imaged resist layer prior to any type of development processing. Thus, the quality and potential resolution of a latent image patterned in the resist layer can be evaluated prior to incurring the time and expense of further processing of the resist.

Specifically preferred aspects of the invention provide fluorescence techniques for detection of latent photoacid images in photoresists, including chemically amplified resists. The results of the analysis then may be used to directly calibrate or otherwise adjust the exposure apparatus used to image to resist, thereby enabling production of developed relief images of enhanced resolution and a consistent lithographic process.

Preferred resists for use in the methods of the invention contain a component that facilitates monitoring of a resist coating layer, particularly a component that can function as a proton acceptor and exhibit a change in fluorescence upon exposure to photogenerated acid. Suitable components include aromatic compounds that have a moiety that can accept a proton such as an amine or other basic group that can serve as a proton acceptor.

Particularly preferred methods of the invention include applying a resist coating layer onto a substrate surface, e.g. a microelectronic wafer surface; exposing the applied resist layer to patterned radiation activating for the resist (e.g., generates photoacid in the resist); monitoring the exposed resist layer e.g. by spectroscopic analysis, particularly fluorescence microscopy; and thereafter further processing the resist layer as desired such as by post-exposure bake (PEB) and development steps. Additionally, if after the monitoring step the resist layer and latent relief image are unsatisfactory, the resist layer simply can be removed and the substrate re-processed, rather than conducting further, unwarranted lithographic processing.

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