Microelectronics - Defect suppression in 193-nm lithography by using an anionic surfactant in the development process


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Abstract

The continued shrinking of dimensions in the photolithographic process is a challenge in microelectronic fabrication. One current hot issue is the formation of “blob defects” or “satellite spot defects”, whose appearances are closely related to the surface properties of the photolithographic polymer materials during the development process. This kind of defects can generate serious problems with decreasing feature size leading to bridging between lines and / or blocking contact holes. They are caused by insoluble agglomerated resist components that adsorb on developed surfaces.

We developed a strategy to reduce “blob defects” on a bottom anti-reflective coating (BARC) surface formed during the development process in 193-nm micro-lithography. By adding an anionic surfactant to the developer solution the defects could considerably be reduced. It was found that the “blob defect” reduction in the photolithographic development process coincides with the amount of adsorbed anionic surfactant on the BARC surface, a more negative surface charge and a more hydrophobic surface. The adsorption process of the anionic surfactant has been studied by null-ellipsometry, streaming potential and contact angle measurements.