METHOD FOR FORMING OPENINGS IN LOW-K DIELECTRIC LAYERS

ABSTRACT

A method for etching contact/via openings in low-k dielectric layers is described. The method introduces a carbon deficient ARL which is compatible with the acidic photoresists used by DUV photolithography. The carbon deficiency of the ARL permits the use of fluorocarbon plasma etching ambients to etch the openings in the low-k layers without excessive polymer formation, thereby eliminating polymer pinch-off during the etching of deep, high aspect ratio contacts and vias in sub-tenth micron integrated circuit technology. Vertical walled contact and via openings may be formed using a DUV photoresist mask and non-oxygen containing fluorocarbon etching plasmas. An additional hardmask is therefore not needed. For non-carbon containing low-k dielectric layers the openings may be etched in simple fluorocarbon plasmas without excessive polymer formation. For low carbon low-k dielectric materials such as alky and aryl polysilsesquioxanes and some organosilicate glasses, the method provides a regimen of hydrogen addition to the etching plasma in order to sufficiently control polymer formation during the contact/via etch to obtain high quality vertical walled openings.

FIG. 2D