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Etch Challenges Brought by the Metal Hardmask Approach for Advanced Contact Patterning with Fluorocarbon-based Plasma JEAN-FRANCOIS DE MARNEFFE, DANNY GOOSSENS, DENIS SHAMIRYAN, HERBERT STRUYF, WERNER BOULLART, IMEC v.z.w. 75 Kapeldreef B-3001 Leuven, Belgium — In order to overcome patterning challenges brought by dimensional scaling and aggressive pitches, extreme ultra-violet (EUV) lithography has been recently pushed forward as a possible solution for IC manufacturing, allowing extended exposure latitude at sub-50nm dimensions. This work address the technological solutions used for contact holes patterning by means of EUV lithography. A metal hard-mask (MHM) approach has been selected, in order to combine the etching of high-aspect ratio features with thin EUV photoresist. The pre-metal dielectric stack covering the active fins was composed of 15nm Si_3N_4 as an etch-stop liner, covered by 240nm SiO_2. The MHM was made of a 30nm TiN film on top of which was spun 20nm of organic underlayer and 100nm of EUV photoresist. This presentation will describe in details the various plasma processing issues and challenges met with this patterning strategy, for down to $\sim$50nm contact hole sizes: SiO_2:TiN and SiO_2:Si_3N_4 selectivities by means of fluorocarbon-based chemistries; loading effects; profile and mask undercut control with CCP plasma; residue cleaning.

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