REFRACTORY METAL CAPPED LOW RESISTIVITY METAL CONDUCTOR LINES AND VIAS FORMED USING PVD AND CVD

ABSTRACT

Capping a low resistivity metal conductor line or via with a refractory metal allows for effectively using chemical-mechanical polishing techniques because the hard, reduced wear, properties of the refractory metal do not scratch, corrode, or smear during chemical-mechanical polishing. Superior conductive lines and vias are created using a combination of both physical vapor deposition (e.g., evaporation or collimated sputtering) of a low resistivity metal or alloy followed by chemical vapor deposition (CVD) (17) of a refractory metal (15) and subsequent planarization. Altering a ratio of SiH_4, to WF_6 during application of the refractory metal (15), cap by CVD allows for controlled incorporation of silicon into the tungsten capping layer. Collimated sputtering allows for creating a refractory metal liner in an opening (14) in a dielectric which is suitable as a diffusion barrier to copper based metallizations as well as CVD tungsten.

FIG. 2A