ABSTRACT

A METHOD TO PREVENT DISHING IN DAMASCENE CMP PROCESS

A method of fabrication of a metal lines without dishing using damascene and chemical-mechanical polish processes. A Key feature is the hard cap layer that is only formed over the trench opening. The hard cap layer prevents dishing of the metal line and also allows faster CMP than blanket polish stop layers. The method includes forming a first dielectric layer having a first trench opening over a semiconductor structure. A metal layer is deposited in the first trench opening. The metal layer has a dimple. The metal layer is preferably composed of Al or Cu. A hard mask is formed having a first opening over the first trench opening. The first opening is at least partially over first trench opening. A hard cap layer (e.g., W or WSi_x) is selectively deposited on the metal layer exposed in the first opening. The hard cap layer, the hard mask, and the metal layer are chemical-mechanical polished to completely remove the hard mask resulting in a metal line having a "dishing free" flat top surface. The chemical-mechanical polish rate of the hard cap is less than the rate of the metal layer.

(FIGURE 1 IS SUGGESTED FOR PUBLICATION)