METHOD TO ENCAPSULATE COPPER PLUG FOR INTERCONNECT METALLIZATION

ABSTRACT OF THE DISCLOSURE

An encapsulated copper plug on a doped silicon semiconductor substrate has a substrate surface, covered with insulation, with a plug hole with a diffusion barrier formed on the walls and the bottom of the hole to the top of the hole. The plug hole is partially filled with an electrolessly deposited copper metal plug. An encapsulating metal deposit caps the plug without any intervening oxidation and degradation. In a transition from copper to a codeposit of copper, an encapsulating Pt, Pd, and/or Ag metal deposits in the electroless bath without oxidation and degradation followed by a pure deposit of the encapsulating metal layer to cap the plug. The surface of the encapsulating metal deposit is formed by overgrowth above the plug hole followed by polishing the surface of the insulator layer removing the overgrowth of the metal layer polished by a CMP process to planarize the surface of the insulator layer which is the top surface of device to achieve coplanarity of metal layer with the topography of the insulator layer.

(FIGURE 1 IS SUGGESTED FOR PUBLICATION)