SELF ASSEMBLED MONOLAYER FOR IMPROVING ADHESION BETWEEN COPPER AND BARRIER LAYER

ABSTRACT OF THE DISCLOSURE

[53] The embodiments fill the need enabling deposition of a thin and conformal barrier layer, and a copper layer in the copper interconnect with good electro-migration performance and with reduced risk of stress-induce voiding of copper interconnect. Electromigration and stress-induced voiding are affected by the adhesion between the barrier layer and the copper layer. A functionalization layer is deposited over the barrier layer to enable the copper layer being deposit in the copper interconnect. The functionalization layer forms strong bonds with barrier layer and with copper to improve adhesion property between the two layers. An exemplary method of preparing a substrate surface of a substrate to deposit a functionalization layer over a metallic barrier layer of a copper interconnect to assist deposition of a copper layer in the copper interconnect in order to improve electromigration performance of the copper interconnect is provided. The method includes depositing the metallic barrier layer to line the copper interconnect structure in the integrated system, and oxidizing a surface of the metallic barrier layer. The method also includes depositing the functionalization layer over the oxidized surface of the metallic barrier layer, and depositing the copper layer in the copper interconnect structure after the funcationalization layer is deposited over the metallic barrier layer.

Figure 5D