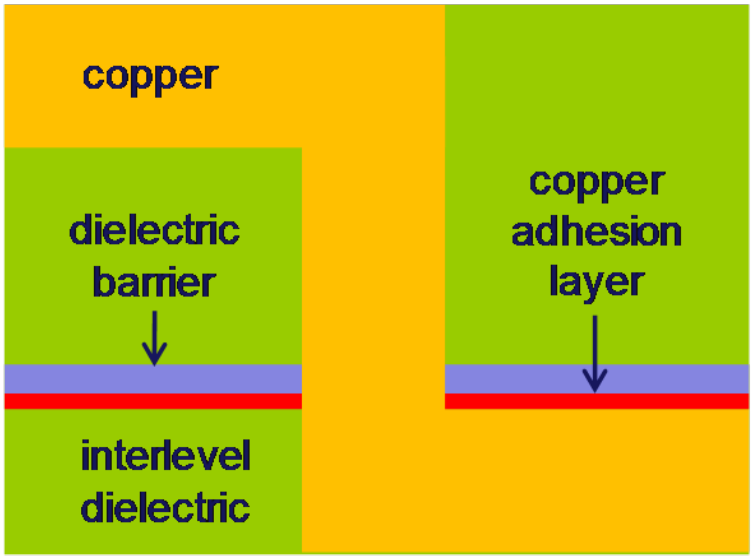
Improving Copper Electromigration Resistance

Raymond N. Virtis, *Air Products and Chemical, Inc., Allentown PA.*



added a thin metal adhesion layer deposited by CVD between the Si_3N_4 or SiCN dielectric barrier layer and the underlying copper layer.

Electromigration resistance is one of the greatest challenges for the 32 nm device node and below. This is currently being addressed by integrating either a SiH_4 treatment that increases copper line resistance or through a selective electroless cobalt deposition that outperforms all other processes but which is difficult to control and expensive.

APCI research at Penn State NNIN site is directed at developing a novel copper treatment that is a simple chemical vapor deposition (CVD) treatment similar to SiH_4, but that yields exceptional performance similar to cobalt. Six precursors were evaluated using Penn State's unique liquid precursor CVD capabilities.

Penn State Site

One exceptional copper adhesion layer was identified at the Penn State NNIN Site and is currently being commercialized by Air Products and Chemicals, *Inc.*