

ABSTRACT OF THE DISCLOSURE

The present invention provides an effective barrier layer for improved via fill in
5 high aspect ratio sub-micron apertures at low temperature, particularly at the contact level
on a substrate. In one aspect of the invention, a feature is filled by first depositing a
barrier layer onto a substrate having high aspect ratio contacts or vias formed thereon. The
barrier layer is preferably comprised of Ta, TaN_x, W, WN_x, or combinations thereof. A
CVD conformal metal layer is then deposited over the barrier layer at low temperatures to
10 provide a conformal wetting layer for a PVD metal. Next, a PVD metal layer is deposited
onto the previously formed CVD conformal metal layer at a temperature below that of the
melting point temperature of the metal to allow flow of the CVD conformal layer and the
PVD metal layer into the vias.

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