A HSQ-based Inorganic Sacrificial Via Filler-assisted 90 nm-node Cu/Low-k OSG Dual Damascene Process Integration

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Integrating FSG dual damascene interconnects using MSQ-based sacrificial via filler has been previously shown [1]. When applying such via filler to a Cu/low-k OSG integration, however, the requisite O_2-ashing induces an inevitable damage to the low-k OSG due to the challenge in selectively eliminating such filler using conventional wet chemistry. By employing an inorganic HSQ that can readily be removed per dilute fluoric acid cleaning in low-k OSG structure, we demonstrated not only a more viable technology with lower defect density at each process step, e.g., photolithography and etching, but also a simpler process that selectively removes the filler material relative to the existing technology based on MSQ and/or organic fillers.