

Abstract Submitted
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Incursion of water and Cu ions into porous low dielectric constant (LKD) thin films and interconnects resulting in damage, time dependent dielectric breakdown (TDDB) and decreased lifetime and reliability. ROBERT LAIBOWITZ, ARCHANA RAJA, Columbia University, THOMAS SHAW, ERIC LINIGER, STEPHAN COHEN, IBM Research Division, COLUMBIA UNIVERSITY COLLABORATION, IBM RESEARCH DIVISION COLLABORATION — Porous dielectrics, their interfaces and related processing details provide many opportunities for water and Cu incursion. The Cu typically starts as part of the electrode and needs a liner to keep it away from the dielectric. As scaling continues thinner liners and imperfections in the in the liner layer can expose the CU to the LKD. This will lead to TDDD with greatly reduced lifetimes. Water exposure can come from processing or through defects in the passivation layer. Most studies of these breakdown effects have been accomplished using accelerated DC measurements in which the sample is destroyed. Dielectric relaxation provides a new set of measurements at low fields, low temperatures and reusable samples. In this way we have observed the presence of both physisorbed and chemisorbed water, determined their activation energy of motion and removal of the water by various annealing protocols. Initial measurements of Cu incursion have also been made. Preliminary measurement of samples containing Cu and water and processing damage show reduced reliability. We also have begun studies to determine the minimum liner thickness. .

Robert Laibowitz
Columbia University

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