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Characterization of electromigration in semiconductor device interconnects using microscopic techniques NARAHARA DINGARI, DAVID HESKETT, University of Rhode Island — Electromigration is an important failure mechanism which affects the functionality and lifetime of integrated circuits. The addition of relatively small amounts of copper has been previously shown to improve device interconnect lifetimes. Through the use of Scanning Electron Microscope (SEM) with Energy Dispersive Spectroscopic (EDS) capabilities we have measured the copper concentration as a function of position along an interconnect after several accelerated stress time periods. We observe a migration of copper atoms from the cathode to the anode side of the interconnect as a function of stressing time. In some cases, a pileup of copper near the middle of the interconnect indicates a blocking of copper diffusion and creates a site for interconnect failure. Metal pileup (hillocks) and depletion (voids) are observed by Atomic Force Microscopy (AFM). We also observe a correlation between relative reflectance using optical microscopy and roughness (observed by AFM) of an interconnect line.

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