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Electromigration in focused ion beam deposited tungsten single nanowires[1] PABITRA MANDAL, BIPUL DAS[2], A. K. RAYCHAUDHURI, S. N. Bose National Center for Basic Sciences, Salt lake, Kolkata-98, India — As the focused ion beam induced deposited (FIBID) nanowires (NWs) of W, Pt are being used in nanoelectronic technology to connect individual nanodevices, repairing damaged interconnects in integrated circuit (IC), electromigration study in FIBID-NWs has become essential. Briefly, when a thin conductor, like metallic Al, Cu interconnects in an IC chip carry quite high current density ˜10^{12} A/m^2, ions or atoms start migrating. Such migration causes void and hillock formation leading to interconnect discontinuity, short circuit and ultimately IC failure. Our electromigration study in single FIBID-NWs of W reveals that failure in NWs of width and thickness ≈100 nm occurs typically at 10^{11} A/m^2. Most notably, void and hillock always form in opposite polarity compared to typical metallic NWs. Such distinctly new outcome is explained via electromigration driven by direct force (ionic charge*electric field) opposed to wind force driven migration observed in metallic NWs. As FIBID-NWs are composite in nature, different species (e.g., Ga, W and C) migrate with different degree and direction depending on their oxidation state, leading to redistribution of species across NW length and formation of a Ga rich hillock.

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