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Classical size effect in nanometric Cu films: the dominant role of grain boundary scattering D. CHOI, Dept. of Mater. Sci. and Eng., Carnegie Mellon Univ., Pittsburgh, PA 15213, T. SUN, A. WARREN, B. YAO, AMPAC, Univ. of Central Florida, Orlando FL 32816, A. DARBAL, K. BARMAK, Dept. of Mater. Sci. and Eng., Carnegie Mellon Univ., Pittsburgh, PA 15213, M. TONEY, Standard Synchrotron Radiation Laboratory, Menlo Park, CA 94025, R. PEALE, Dept. of Physics, Univ. of Central Florida, Orlando FL 32816, K. COFFEY, AMPAC, Univ. of Central Florida, Orlando FL 32816 — Surface and grain boundary electron scattering contribute significantly to resistivity as the dimensions of polycrystalline metallic conductors are reduced to, and below, the electron mean free path. In this work, a methodology is reported to independently evaluate surface and grain boundary scattering in encapsulated polycrystalline Cu thin films, with thicknesses of 28-158 nm, grain sizes of 35-466 nm, and interface roughnesses of 0.2-2 nm. The film resistivity, measured at both room temperature and at 4.2 K, is compared for samples having different grain sizes and film thicknesses. The resistivity contribution from grain boundary scattering is found to be dominant in SiO_2/Cu/SiO_2 and Ta/ SiO_2/Cu/Ta/SiO_2 films. Resistivity data for a third set of samples, namely SiO_2/$TaSiN_x$/Cu/$TaSiN_x$/SiO_2, will also be presented.

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