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Comparison of Tunnel Barrier Thickness Determined by ARXPS and WKB Transport Fit Methods ZAC BARCIKOWSKI, Y. X. HONG, University of Maryland - College Park, J. M. POMEROY, National Institute of Standards and Technology — Tunnel junction devices are fabricated with ultrathin AlOx tunnel barriers and characterized using in-situ angular resolved X-ray photoemission spectroscopy (ARXPS) and ex-situ transport measurements. In the ultrathin limit, accurate measurement of thin film thickness remains extremely difficult. We derive the thickness from ARXPS and WKB transport fitting results, which provide two indirect, yet fundamentally different methods of estimating the tunnel barrier thickness. We compare the results of both methods using several Co/AlOx/Co tunnel junctions with different tunnel barrier thicknesses. For example, data of a 1.1 nm Al film plasma oxidized for 7 s in 160 mtorr O_2 yields a tunnel barrier thickness of 1.3 nm with WKB fitting and 1.5 nm with ARXPS. Tunnel barrier composition data and thickness (s) estimations obtained by ARXPS are compared with tunnel barrier height (Φ) and width (s) obtained by WKB transport fitting.

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