

Abstract Submitted
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Atomic Layer Deposition of AlOx for Metal-AlOx-Metal Tri-layers and Resonators A. KOZEN, L. HENN-LECORDIER, X. CHEN, M. SCHROEDER, University of Maryland, C. MUSGRAVE, University of Colorado, G. RUBLOFF, University of Maryland — The dielectric layer in conventional Josephson junction qubits is fabricated by thermal oxidation of aluminum. These dielectrics suffer from high loss tangents thought to be due to defect-related quantum two level systems. Our collaborators have identified the -OH rotor associated with hydroxyl species in the AlOx as a prime defect candidate. We demonstrate the fabrication of the AlOx dielectric in MIM structures using atomic layer deposition (ALD) from trimethylaluminum and both H2O and D2O precursors. ALD enables precise control of film growth at the atomic scale, while comparison of D2O vs H2O as the oxidation precursor should reveal the role of this defect in the loss tangent. We have developed the D2O based ALD process, observed similar kinetics and properties for D2O and H2O based ALD for AlOx, and characterized the materials by SIMS, XPS, and electrical measurements of MIM capacitor structures. Correlation between room temperature electrical measurements and low temperature resonator performance will be discussed.

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