Abstract Submitted
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Low temperature atomic layer deposition of α-Fe_2O_3[1] JEFFREY KLUG, THOMAS PROSLIER, Argonne National Laboratory, NICHOLAS BECKER, Argonne National Laboratory and Illinois Institute of Technology, JEFFREY ELAM, MICHAEL PELLIN, Argonne National Laboratory — There is significant interest in the use of α-Fe_2O_3 (hematite) as a semiconducting thin film in a variety of applications including solar energy conversion, water oxidation, and gas sensing. In many such applications, devices may depend on non-planar geometries where traditional thin film deposition techniques are limited by line-of-sight constraints. Atomic layer deposition (ALD) is a gas-phase synthesis technique utilizing sequential self-saturating surface chemical reactions to produce uniform coatings with atomic scale control on substrates with arbitrary shape. However, ALD processes explored for Fe_2O_3 to date generally suffer from either extremely low growth rates, narrow temperature windows for self-saturating growth, or precursors with limited reactivity. In this respect, we will present a detailed study of a new, previously unexplored process for ALD of α-Fe_2O_3 at technologically relevant temperatures between 200-300°C. Self-limiting growth at $\sim$0.7 Å/cycle was confirmed via situ quartz crystal microbalance. The results of in situ process characterization and ex situ analysis of film structure, morphology, composition, and electrical properties will be presented.

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