

Abstract Submitted
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Atomic layer deposition of metallic cobalt JINHEE KWON, the University of Texas at Dallas, MARK SALY, RAVI KANJOLIA, SAFC, YVES CHABAL, the University of Texas at Dallas, THE UNIVERSITY OF TEXAS AT DALLAS COLLABORATION, SAFC COLLABORATION — Metallic cobalt has rich catalytic, electronic and magnetic properties, which makes it critical to have a better control of Co thin film deposition for various applications. This work focuses on the atomic layer deposition (ALD) of cobalt using (tertiarybutylallyl)cobalttricarbonyl (${}^t\text{BuAllyl}\text{Co}(\text{CO})_3$) and dimethylhydrazine (DMHy) on H-terminated Si to uncover the growth mechanisms. The first pulse of (${}^t\text{BuAllyl}\text{Co}(\text{CO})_3$) reacts with surface H-Si bonds completely, forming one monolayer of metallic silicide. In situ infrared absorption spectra show that further deposition of Co is made possible only after linear carbonyl groups which remain after the first (${}^t\text{BuAllyl}\text{Co}(\text{CO})_3$) pulse as the surface ligand are removed by subsequent ALD cycles. Further ALD cycles give rise to metallic Co growth through ligand exchange after a nucleation period of 8–10 cycles. The derived growth rate of cobalt is $0.6 \pm 0.1 \text{ \AA}/\text{cycle}$. The resultant Co film shows low concentration of carbon and nitrogen impurities in the bulk according to X-ray photoemission spectroscopy.

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