

Materials Science and Engineering

PhD Defense Notice

Wednesday, April 11, 2018
Rauch 091 – 10:00 a.m.

Ling Ju

Title:

New Chemistries and Processing in Atomic and Molecular Layer Deposition of Inorganic and Hybrid Organic-Inorganic Thin Films

Abstract:

Highly controlled thin films are critical to modern microelectronics industry. Atomic layer deposition (ALD) is based on sequential self-limiting chemisorption reactions, resulting in uniform, conformal films with great control over the thickness. Similar reactions are extended to molecular layer deposition (MLD) where organic fragments are involved in the film growth. ALD and MLD are combined to produce inorganic-organic hybrid materials with tunable composition and properties.

ALD SiO₂, which is traditionally difficult to grow due to the lack of good precursors, was deposited using a new group of volatile aminosilanes, cyclic azasilanes (AZ) and O₃ as precursors. The AZs possess high vapor pressure and reactivity for ring opening reactions upon exposure to -OH groups. They were also used to grow hybrid organic-inorganic films with maleic anhydride (MA), trimethylaluminum (TMA), and H₂O. Large growth rate of ~ 90 Å/cycle indicated diffusion of precursors into the films, which is highly dependent on the purge time and reactor temperature. Porosity was evidenced by a small dielectric constants. These chemistries offer a route to tunable thin films and have potential applications in diffusion barrier, low dielectric constant layers, and passivation layers.