Deposition of Carbon Nitride Films from Single-Source s-Triazine Precursors

Jianjun Wang, Dale R. Miller, Edward G. Gillan*

Department of Chemistry and the Optical Science and Technology Center, University of Iowa, Iowa City, Iowa 52242-1294 USA

Abstract

Trisubstituted derivatives of s-triazine (1,3,5-triazine) with N(i-Pr)_2, N(i-Bu)_2, NH(t-Bu), pyridyl, and NHHMe ligands were used as single-source precursors to produce carbon nitride (CN_x) thin films via hot wall CVD. The precursors are either commercially available or were synthesized in straightforward, one-pot procedures, and the synthesis and characterization of tris-2,4,6-methylhydrazino-1,3,5-triazine (TMHT) is reported for the first time. All of the precursors studied are thermally stable and volatilize below 250 °C. They thermally decompose between 500 and 1000 °C, resulting in CN_x films with x ranging from 0.95 to 0.03. The film deposition temperature and nitrogen content depend upon the structure and stability of the precursor. The film properties vary from disordered insulating structures with high nitrogen content (CN_{0.95}) to low nitrogen content turbostratic carbon films. The films on Si and SiO_2 substrates were characterized by Auger surface analysis, FT-IR and Raman spectroscopy, X-ray diffraction, and scanning electron microscopy.