Abstract Submitted
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Synthesis and Oxidation Resistance of h-BN Thin Films[1] DAVID STEWART, ROBERT MEULENBERG, ROBERT LAD, Univ of Maine — Hexagonal boron nitride (h-BN) is an exciting 2D material for use in sensors and other electronic devices that operate in harsh, high temperature environments. Not only is h-BN a wide band gap material with excellent wear resistance and high temperature stability, but recent reports indicate that h-BN can prevent metallic substrates from oxidizing above 600°C in low O_2 pressures. However, the PVD of highly crystalline h-BN films required for this oxidation protection has proven challenging. In this work, we have explored the growth of h-BN thin films by reactive RF magnetron sputtering from an elemental B target in an Ar/N_2 atmosphere. The film growth rate is extremely slow and the resulting films are atomically smooth and homogeneous. Using DC biasing during deposition and high temperature annealing treatments, the degree of film crystallinity can be controlled. The oxidation resistance of h-BN films deposited on inert sapphire and reactive metal substrates such as Zr and ZrB_2 has been examined by techniques such as XPS, XRD, and SEM after oxidation between 600 and 1200°C under varying oxygen pressures. The success of h-BN as a passivation layer for metallic substrates in harsh environments is shown to depend greatly on its crystalline quality and defects.

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