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Incorporating Si into cubic boron nitride films via plasma enhanced CVD: Can n-type doping be achieved? . SHAMMAS, APS — Silicon has been reported as an n-type dopant for cubic boron nitride (c-BN) crystals synthesized via high pressure high temperature synthesis and for films deposited via physical vapor deposition. Recent advances in deposition techniques have allowed for c-BN films to be deposited via plasma enhanced chemical vapor deposition (PECVD) employing fluorine chemistry. Such films have been reported to exhibit a negative electron affinity (NEA) surface. As a consequence of the NEA surface, electrons excited to the conduction band can be emitted into a vacuum without having to overcome an additional energy barrier. The effects of n-type doping and an NEA surface could yield a low work function material, with potential for applications utilizing electron emission. To date, the electronic structure, work function, etc. of Si-doped c-BN films deposited via PECVD has not been reported. Photoelectron spectroscopy is used to probe the surfaces of c-BN films containing Si to determine the Fermi level position and deduce if doping can be realized. This research is supported by the Office of Naval Research through grant N00014-10-1-0540.

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