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Leakage current mechanisms in PECVD-grown amorphous hydrogenated boron carbide thin films BRADLEY NORDELL, CHRIS KECK, JUSTIN HURLEY, THUONG NGUYEN, Department of Physics and Astronomy, University of Missouri-Kansas City, SEAN KING, Logic Technology Development, Intel Corporation, Hilsboro, OR, SUDAUNSHU PUROHIT, Department of Chemistry, University of Missouri-Kansas City, ANTHONY CARUSO, MICHELLE PAQUETTE, Department of Physics and Astronomy, University of Missouri-Kansas City — Thin-film amorphous hydrogenated boron carbide (a-BxC:Hy), grown by plasma-enhanced chemical vapor deposition (PECVD) from orthocarborane (C2B10H12), has emerged as a promising semi-insulating, moderately high bandgap (2–4 eV), p-type material for direct-conversion solid-state neutron detector and low-dielectric-constant (low-κ) intra/interlayer dielectric (ILD) applications. Attaining a complete understanding of the electrical transport properties for amorphous semiconductors is challenging, but essential for material maturation and optimization. For the above applications, understanding leakage current mechanisms, in both the low and high field regimes, is particularly relevant. This contribution will shed light on the charge transport mechanisms in a-BxC:Hy and discuss the role played by Urbach energy and band gap. Current density (J) as a function of field (E) was measured for a range of films grown with different PECVD parameters, and the resulting J–E curves were analyzed. The band gap and Urbach energy were measured by fitting absorption coefficient data obtained from transmission UV-Vis spectroscopy in the Tauc and exponential regions. We will discuss how optimizing bandgap and Urbach energy can be used to improve leakage current.

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