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Low-temperature Plasma Enhanced Chemical Vapour Deposition of Nanodevice-grade nc-3C-SiC KOSTYA (KEN) OSTRIKOV, Plasma Nanoscience, The University of Sydney, QIJIN CHENG, SHUYAN XU, JIDONG LONG, NIE and Institute of Advanced Studies, Nanyang Technological University — The development of robust fabrication techniques that are capable of achieving a synergy of essential structure-, composition-, function/property-, application-, and process-related requirements in the same material is the ultimate goal of Materials Science [1]. Despite the outstanding chemical, mechanical, optical and thermal properties of bulk SiC, applications of nanocrystalline silicon carbide (nc-SiC)[2] in nanodevices are hampered by a substantial lack of such synergy. Here we report on the plasma-based synthesis of nanodevice-grade nc-3C-SiC films, with very high growth rates (7-9 nm/min) at low and ULSI technology-compatible process temperatures (400-550 ^{o}C), featuring: high nanocrystalline fraction (67% at 550 ^{o}C); good chemical purity; excellent stoichiometry throughout the entire film; wide optical band gap (3.22-3.71 eV); refractive index close to that of single-crystalline 3C-SiC; and clear, uniform, and defect-free Si-SiC interface. The counter-intuitive low SiC hydrogenation in a H_2-rich plasma process is explained by hydrogen atom desorption-mediated crystallization. [1] K. Ostrikov, Rev. Mod. Phys. 77, 489 (2007) [2] Q. J. Cheng, S. Xu, J. D. Long, K. Ostrikov, Appl. Phys. Lett. 90, 173112 (2007)

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