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"Nucleation and glide of basal plane dislocations during 4*H*-SiC homoepitaxy"

Friday, October 5, 2007
11:00 A.M. Seminar in Hamerschlag Hall B131
Refreshments precede seminar at 10:30 A.M. in 2325 Wean Hall

Silicon carbide (SiC) is a promising wide bandgap semiconductor for high-power and high-temperature electronic devices. Its homoepitaxy technique has advanced significantly during the past 20 years. Many of the defects common in epilayers have either been eliminated or reduced in density. However, the demand for higher current rating of power devices necessitated continuous increase of device size and reduction of extended defect densities. An important category of extended defects in SiC epilayers are basal plane dislocations (BPDs). These defects act as nucleation sites for single layer Shockley-type stacking faults which account for the degradation of SiC bipolar devices operating under forward bias. Most of the BPDs in the SiC epilayers propagate from the substrates. However, two characteristic types of BPDs were suggested to be due to either nucleation or multiplication during epitaxy. One is straight BPD segments along the epilayer/substrate interface (interfacial dislocations). The other is short BPD arrays connected to the epilayer surface by threading segments. These arrays which sometimes extend macroscopic distances are referred to as "pair arrays". It is argued here that both types are two parts of one defect produced by the glide of a basal plane dislocation under the influence of shear stress. In fact, shear stresses exceeding the critical resolved shear stress (CRSS) are common during epitaxy and affect morphology of most BPDs. The origin of such stresses will be discussed.

Xuan received her Master and Bachelor degree in Materials Science and Engineering from Tsinghua University, Beijing, China in 2003 and 2000, respectively. She is currently a Ph.D. candidate under the guidance of Prof. Skowronski.