Materials Science & Engineering Thesis Defense

Characterization of Electrically Active Defects at Nb/Si Interface Using Transport and Transient Capacitance Measurements

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abstract

Our aim is to use current-voltage (I-V) and Deep Level Transient Spectroscopy (DLTS) measurements to characterize the Niobium-Silicon interface and identify the concentration and physical character of the electrically active defects present in this material system and propose a way to mitigate the presence of such defects at the interface. Barrier height determinations using temperature-dependent I-V measurements at -125 to 25 C indicate that the barrier height decreases from 0.5 eV to 0.48 eV for anneals above 200 C. A significant increase in leakage currents in most cases is most often observed. Successive anneals on devices dominated by leakage currents annealed at temperatures ranging from 150 C to 250 C exhibit a significant decrease in leakage currents, resulting in a near ideal device after annealing at 250 C. In both cases, DLTS measurements of samples after 250 C anneals found that the defect concentration in the depletion region drops markedly after annealing.

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