

## **Fabrication And Characterization Of Si Quantum Dots And SiO<sub>2</sub> Tunnel Barriers Grown By A Controlled Oxidation Process**

### **Abstract**

The control of the growth of silicon dioxide (SiO<sub>2</sub>) and the formation of quantum dots (QDs) play an important role in the fabrication of single-electron transistors (SETs). In this work, SET structures were fabricated using a systematic oxidation technique known as the pattern-dependent oxidation (PADOX) process. For comparison, two oxidation processes using conventional furnace and rapid thermal processing (RTP) were used. The oxidation temperature for both oxidation processes was set at 1000°C and the oxygen flow rate in the furnace was set at 1 l min<sup>-1</sup>. The nanostructures were characterized using AFM, SEM and TEM to determine the quality and the stoichiometry of the Si QDs and the oxides. The oxidation rate using a furnace is 0.36 nm s<sup>-1</sup>, significantly lower than the RTP value which is 2.16 nm s<sup>-1</sup>. Meanwhile, the oxygen contents in SiO<sub>2</sub> grown by furnace and RTP are approximately the same.