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Photoluminescence from silicon nanocrystals embedded in Silicon oxides WEI PAN, M.S. CARROLL, R.G. DUNN, J.C. BANKS, T.J. HEADLEY, Sandia National Laboratories, Albuquerque, NM 87185 — Much progress has been made in highly luminescent silicon nanocrystal (SNCs). Effects of nanocrystal size and density, as well as defect passivation, are known to strongly affect the SNC optical properties. Yet their mechanisms are not completely understood. Here, we present results from photoluminescence (PL) studies. A broad PL peak, centered at $\sim$ 1.3 eV and blue-shifted from the Si substrate peak at $\sim$ 1.1 eV, is observed. It is attributed to emission from SNCs of diameter $\sim$ 5 nm. Annealing specimen in a forming gas at 410 °C is found to change the PL intensity. Results from temperature dependent and magneto-PL studies will also be discussed.

The SNCs are formed by first depositing silicon rich oxides (SRO) on a [100] Si wafer, using high density plasma chemical vapor deposition. The as-deposited SRO films are then annealed in a nitrogen ambient at higher temperatures, which phase segregates the extra Si into SNCs in the oxide. The silicon content in the films was determined using Rutherford Backscattering (RBS) and nanocrystal formation was confirmed using transmission electron microscopy (TEM).

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