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Near-infrared photoluminescence of germanium nanocrystal synthesized in inverse micelle ZHIFENG REN, Boston College, WENZHONG WANG, Boston College, KEDA WANG, Boston College, DAXING WANG, Boston College — In this work we study photoluminescence (PL) properties of Ge nanocrystals prepared via a low-temperature inverse micelle solvothermal route. The as-prepared nanocrystals have an average diameter of $\sim$ 24 nm. Visible- and near-IR PL is observed from the pure nc-Ge samples at room temperature. We present the PL results in the near-IR range. The PL was excited using either 488-nm or 632-nm laser lines. The luminescence signal was dispersed by a grating monochromator and then collected by a liquid-nitrogen cooled Ge detector. The lock-in technique was used with a light chopper at a frequency of 17 Hz. We found two peaks located at $\sim$1.37 eV (905 nm) and $\sim$1.45 eV (855 nm). Those are within the wavelength range for optical communications. Upon oxidation the relative intensity of the 1.45 eV peak was enhanced. And then the intensity decreased after hydrogen annealing. Meanwhile, the changes of 1.37 eV peak is negligible upon either oxidation or hydrogen annealing. The origination of the near-IR luminescence peaks is discussed. The 1.45 eV peak is more likely related with the surface states of the nc-Ge particles; while, the 1.37 eV peak is more likely originated from the bulk of the nc-Ge.

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