

Synthesis and characterization of lead chalcogenides nanocrystal quantum dots and wires

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Semiconductor nanocrystal quantum dots (NQDs) offer possibilities of improving the efficiency of solar cells by extending the bandgap toward the infra-red region. Here we have synthesized lead chalcogenides with their tunable band edge emission from 1.2 micrometer to around 2.5 micrometer. Changes in coordinating ligands allowed us to control the morphology from dots to more extended nanostructures.

TONOS (TiN-Oxide-Nitride-Oxide-Si) Flash Memory with ONO and NON Tunneling Barriers

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Floating gate-type flash memory devices are rapidly approaching the limit of scaling associated with floating gate coupling and gate leakage current while the charge trap flash (CTF) type memory devices have attracted much attention due to their advantages over traditional floating gate-type flash memory devices, such as lower programming voltage, better scalability, improved endurance and a simple fabrication process compatible with standard CMOS technology. Moreover, the CTF-type memory devices can be applied to the 3D integration for next generation non-volatile memory (NVM) technique. However, the conventional CTF-type devices have fundamental problems with a trade-off between the data erasing speed and the data retention time. In order to overcome these problems, the NVM using the engineered tunnel barriers (TBE) with high-k/low-k stacks were proposed as one of the solutions for improving the device performances. The engineered tunneling barriers suppress the direct tunneling at low electric field region during retention operation due to the increase of physical oxide thickness, while it allows efficient tunneling of electrons and holes at a high electric field region due to the band offset and enhanced field sensitivity.

In this paper, the TBE-TONOS memory devices with engineered tunnel layer ($\text{SiO}_2/\text{Si}_3\text{N}_4/\text{SiO}_2$ and $\text{Si}_3\text{N}_4/\text{SiO}_2/\text{Si}_3\text{N}_4$) and TiN gate were fabricated. The program/erase speed and data retention characteristics of TBE-TONOS memory device were investigated and excellent performances were obtained.

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