NT-P25

Memory characteristics of Cobalt-Silicide nanocrystals embedded in HfO_2 gate oxide for nonvolatile flash devices

JunSeok Lee, JooHyung Kim, JungYup Yang, JinPyo Hong*

New functional materials and devices lab, Department of Physics, Hanyang University

Cobalt-Silicide ($CoSi_2$) nanocrystals (NCs) were investigated for use in charge storage for metal oxide semiconductor (MOS) devices with thin HfO_2 tunneling and control oxide layers. $CoSi_2$ NCs were synthesized by exposure of Co/Si/HfO_2 tunneling oxide/Si stacks to an external UV laser (Nd:YAG, wavelength 355nm). The thicknesses of the Co and Si layers were intentionally controlled to obtain ideal $CoSi_2$ NCs. Cross-sectional high resolution transmission electron microscopy(TEM) analysis of $CoSi_2$ NCs reveal distinct lattice fringe patterns, indicating the highly crystalline nature of the $CoSi_2$ NCs. Observations from x-ray photoelectron spectroscopy and TEM clearly confirm the formation of $CoSi_2$. These $CoSi_2$ NCs in MOS devices exhibited a large memory window of 3.4V as well as efficient programming/erasing speeds and good retention and endurance times.