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## Microstructure and charge trapping in ZrO<sub>2</sub>- and Si<sub>3</sub>N<sub>4</sub>-based superlattice layer systems with Ge nanoparticles

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### Abstract

Ge was deposited on silicon as a superlattice with 10 layers of Ge embedded in Si<sub>3</sub>N<sub>4</sub> or ZrO<sub>2</sub> matrices via plasma enhanced chemical vapor deposition or RF-sputtering, respectively. Raman spectroscopy, transmission electron microscopy and capacitance-voltage (CV) measurements were performed in order to investigate the structural and electrical properties of the superlattices. It will be shown that, in contrast to furnace annealing, flash lamp annealing of Ge-ZrO<sub>2</sub>-superlattices leads to crystalline Ge nanoparticles in an amorphous matrix. As revealed by CV measurements, these layers show excellent charge storage capabilities. In comparison, a higher thermal budget is needed to crystallize Ge in case of Si<sub>3</sub>N<sub>4</sub>-based superlattices, and no significant charge trapping could be detected during CV measurements.

Keywords: Germanium; Nanocrystals; Zirconium oxide, Silicon nitride; Superlattice; Flash lamp annealing; Charge trapping

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