## Nanocomposite and nanomaterials

# Resonant tunneling at electron field emission from Si nanowires coated with $SiO_x$ and $SiO_2$(Si) films

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The presence of regions with negative differential conductivity in current-voltage characteristics widely used to create a superfast oscillators and logic devices.

The electron field emission (EFE) from Si nanowires (Si NW) coated with ultrathin $SiO_x$ or nanocomposite $SiO_2$(Si) films containing Si nanocrystals embedded into silicon dioxide matrix of varying thickness have been investigated. The peaks in emission current-voltage characteristics have been observed in case of some definite thicknesses of the films. The emission I-V characteristics in Fowler-Nordhein coordinates in case of 2.6 nm thick $SiO_2$(Si) film is shown in Fig. 1. As can be seen, there are the peaks and regions with negative differential conductivity.

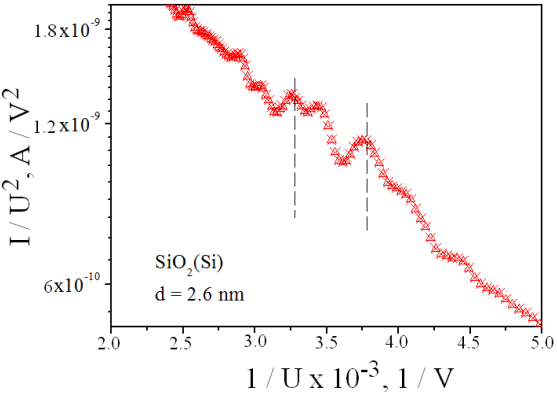


Fig. 1. Emission I-V characteristic in Fowler - Nordheim coordinates from Si NW coated with $SiO_2$(Si) film ($d$ = 2.6 nm).

The observed experimental results have been explain on base of resonance tunneling through multilayer structure containing $SiO_2$ sublayer from one (inner) side and $SiO_2$ sublayer+vacuum from outer side as the barriers and Si nanocrystals as the quantum well. The fitting of theoretical modeling to experimental results allowed to clarify some details of the nanostructure.