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Observation of shape restoration effect in core-shell nanowire structures

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The combination of two different nanostructured materials into a heterostructure can lead to completely new novel properties, which for both materials separately is missing. One of the most interesting and promising structures in this field are core-shell materials, for example nanowires (NWs), where the core material (metal, oxide) is covered by a other material (metal, oxide). In this work, Ag-SiO₂ core-shell NWs were fabricated using a known sol-gel method, where Ag NWs were covered with a uniform SiO₂ layer. The enhanced mechanical properties were demonstrated via the cantilevered beam bending technique carried out in a scanning electron microscope. The improved fracture strength and resistance to fatigue were shown and compared to the bare Ag NWs. Under electron beam radiation a novel shape restoration effect was demonstrated and studied. To fully understand this phenomenon the core and shell materials were analysed separately. Mechanical tests were conducted on the empty SiO₂ shells and on Ag NWs. The experimental conditions were simulated using the finite element method and the mechanisms behind the shape restoration and fracture resistance were proposed.

Biography

Mikk Antsov is a second year PhD student and is currently working in the University of Tartu, Institute of Physics in the Laboratory of Nanostructured Materials. His current research involves the study of the mechanisms of nanoscale friction and the mechanical properties of different nanostructures. He has published 9 papers on these topics in reputed journals.

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