

Title: Silicon nanostructures for third generation photovoltaic applications

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Type: Theoretical

Abstract:

Third-generation solar cells are high-efficiency and cost-competitive multiple energy threshold devices based on the widening of the absorbed solar spectrum to enhance carrier collection. In this field nanostructures of Si (N-Si) in an insulating matrix have a great technological importance, being the constitutive elements of the high performance multijunction cells. The main obstacle for the efficient extraction of photogenerated carriers is the insulating matrix around the Si quantum structures. The tunnelling probability that affect transport properties is, actually, strongly dependent on the height of the barriers. Different matrices, like Si₃N₄ and SiC, give different transport barriers, lower than the usual native SiO₂ allowing larger dot spacing for a given tunnelling current. We intend to study the structural, electronic, optical and in particular transport properties of these N-Si/insulator systems as a function of the embedding matrix, of the NCs size and density and of doping.

Collaborations: Collaboration with R. Del Sole (Univ. Tor Vergata, Rome) and ETSF (European Theoretical Spectroscopy Facility).

Coworkers: (at UniMORE) Dr. Roberto Guerra

Extra-bourse (about 15keuro/year) available: maybe