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Consiglio Nazionale delle Ricerche

IMEM-CNR, Sala A – 28/01/2020, ore 14.30

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Studies of nanostructured III-V and hybrid solar cells

Abstract

The study and fabrication of structures in nanometric scales are strategical for the realization of new solar cells, with optimized efficiency/cost ratios. With appropriate nanostructures it is possible to take advantage of the quantum effects as well as to obtain geometries with high surface to volume ratio.
In this talk will be presented different approaches, developed in our LABSEM and LADOR groups, to fabricate nanostructured photovoltaic cells, based on quantum dots, nanowires and mesoporous films. In the first system, quantum dots are grown by Metal-Organic Vapor Phase Epitaxy (MOVPE) to produce intermediate band solar cells. In this structure, an intermediate band is formed by the quantum dot confined states, allowing the creation of additional electron-holes pairs through the absorption in two sub-bandgaps.
Next, the talk will focus on hybrid solar cells, in which inorganic materials are combined with organic materials and can theoretically present high efficiency and stability of inorganic cells and low cost of organic cells. In this case, the necessity to obtain a high interface area between the two material types stimulates the interest in using nanostructure, in particular nanowires and mesoporous films.