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Trace of Increasing Dot Size in Porous Silicon systems of Same Thicknesses

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Abstract

The present work enables the understanding of the porous system of porous silicon (PS) in terms of growth of dots and wires (quantum Si nanostructures) under certain conditions. When it comes to optical properties, PS should be recognized in terms of growth of the dots and wires instead of its porosity as ~2-5nm sized Si-nanostructures are responsible for luminescence. In present work, the photoluminescence (PL) spectra of PS samples of thickness 1 μm were used to estimate the percentage, average diameters and corresponding variances of dots and wires nanostructures by Singh and John (John-Singh) model. We have explicitly included the role of surface states on the fitting of John-Singh model. As a result, the plotted analytical curve revealed that an increase of current density, for fabricating the same thickness of the PS systems, results in the homogeneous formation of relatively thinner wires with a simultaneous growth of dots. It is a useful clue towards the fabrication of silicon quantum dots for photonic applications.

Keywords: A1. Crystallites; A1. Etching; A1 Nanostructures; A1 Low dimensional structures; A1 Growth models

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