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A Novel Method for Rapid Fabrication of Boron-Doped Luminescent Porous Silicon

Quantum dots exhibit narrow linewidths stemming from their size, semiconductor composition, and confinement regions, making them ideal candidates for solid state lighting applications. Currently, silicon quantum dots are utilized in a wide variety of applications, from biomedicine to catalysts. Research continues to elucidate their fundamental nature; seeking to solve inefficiencies and pervasive problems such as quantum blinking, which causes quantum dots to lose photoluminescence. In many applications, this loss of photoluminescence means a loss of function for the quantum dots, so it is important to understand the phenomenon on a fundamental level and develop blink-off proof samples. Testing blinking hypotheses requires chemically passivated quantum dots, these already exist, however require days to years to manufacture and result in low yields. In this study we present a method for the fabrication of stable p-type porous silicon quantum dots. Using a photoelectrochemical etching procedure, followed by low temperature furnace oxidation, then a chemical etch, and finally a steam oxidation method, passivated porous silicon with tunable photoluminescence can be created. The entire process is also significantly faster than traditional methods, only taking around an hour from start to finish.

Academic or Professional Status

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