Zinc oxide (ZnO) is a versatile functional material due to its wide direct bandgap, large excitation binding energy of 60 meV and technological applications, specifically in electronic and optoelectronic devices such as photodetectors, light-emitting diodes, solar cells and gas sensing. Several different morphologies of ZnO nanostructures have been synthesized by various methods, such as RF magnetron sputtering, spray pyrolysis, chemical vapor deposition, pulsed laser deposition and sol-gel process. In particular, the growth of ZnO nanostructures by radiofrequency sputtering enables the deposition atom by atom on surfaces and the nature of the substrate surface plays a crucial role in determining the morphology of the grown nanostructures. Due to the fact that porous silicon (PS) is characterized by its open structure, tunable pore dimensions, large surface area and compatibility with the silicon IC technology, in this work, zinc oxide was deposited on macroporous silicon (macroPS) substrates by radio frequency sputtering technique to study the morphology and growth kinetics. The formation of ZnO nucleation centers and their growth as nanoclusters and pyramidal nanostructures, on the rough surface/walls of PS substrate, have been studied as a function of substrate temperature during the deposition. Scanning electron microscopy and X-Ray diffraction were used to observe the morphology and investigate the evolution of the crystalline orientation, respectively.

**Keywords:** Porous Silicon, RF sputtering, zinc oxide

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