Influence of Anodizing Parameters on the Electrochemical Characteristics and Morphology of Highly Doped P-type Porous Silicon

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Abstract:

Controlling pore structure, e.g. pore diameter, size and distribution of porous silicon (PS) is highly needed for technological applications such as microfluidic operation and filtration in which the pore size and shape can block the entrance of some species or increase its concentration or purity by separation. In the present study, highly doped p-type silicon is utilized to prepare PS with different pore dimensions by electrochemical etching (anodization) process in HF and C2H5OH mixture. The anodization process was performed under various conditions such as different electrolyte types, temperature, and concentrations, etching potential, current density, and etching duration. This research was to further study the influence of electrochemical etching parameters on pore formation kinetics including pore size, layer thickness and mechanistic aspects of silicon etching. The study offers a fundamental understanding of the fabrication process of porous silicon that may be exploited in nanotechnology applications. The present study confirms that the anodization rate increases with increasing the steady-state current at all the presented conditions. It is demonstrated that adjusting the anodizing potential is very important as it determines whether the anodization will lead to PS formation and/or PS dissolution.

Keywords:

Anodization; Porous silicon; Microstructure; P-type silicon

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