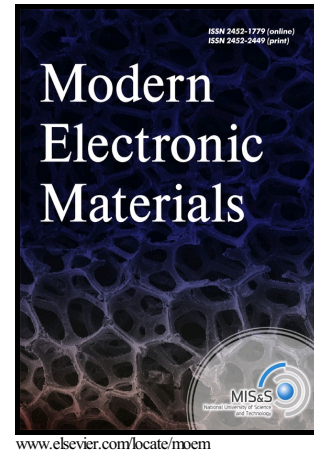


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Formation of cross-cutting structures with different porosity on thick silicon wafers

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Formation of cross-cutting structures with different porosity on thick silicon wafersVera A. Yuzova¹, Fedor F. Merkushev¹, Eugene A. Lyaykom¹¹Siberian Federal University, 79 Svobodny Ave., Krasnoyarsk 660041, Russia

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Abstract. Three-layered pass-through structures of two types have been obtained on 500 micron thick single crystal silicon wafers by electrochemical etching in a 48% solution of hydrofluoric acid without using additional single crystal layer removal operations. The first type of the pass-through structures comprises two outermost 220-247.5 micron thick macroporous silicon layers with a pore diameter of 7-10 microns and an intermediate 5-60 micron thick mesoporous silica layer with a pore diameter of 100-150 nm. For the formation of the first type structures we used two-stage etching without cell disassembly:

- in a 48% water solution of hydrofluoric acid ($\text{H}_2\text{O} : \text{HF} = 1 : 1$ vol.) for 140-180 min with a current density of 40 mA/cm^2 ;
- in a 48% water/alcohol solution of hydrofluoric acid ($\text{H}_2\text{O} : \text{HF} : \text{C}_2\text{H}_5\text{OH} = 1 : 1 : 1$ vol.) for 60-90 min with a current density of 10 mA/cm^2 .

The second type pass-through structures include a macroporous silicon layer with a thickness of 250 microns which interlock in the depth of the silicon wafer to form a cavity with a size of 4-8 microns. For the formation of the second type structures we only used the first one of the abovementioned stages, the etching time being longer, i.e. 210 min. All the etching procedures were carried out in a cooling chamber at $5 \text{ }^\circ\text{C}$. The developed technology will provided for easier

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