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Physical and mechanical properties of silicon near the SiO_2/Si interface

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Abstract

The influence of an oxide coating on the strength characteristics of single-crystal silicon surface layers is investigated by the microindentation method. It is shown experimentally that a strengthened layer with a thickness of 0.2–0.4 μm and a microhardness of 20–35 GPa, which is two or three times as much as the microhardness of bulk single-crystal silicon, is present near the SiO_2/Si interface. The thickness and microhardness of this layer depends on the growth conditions of the oxide. The formation of this layer is most probably caused by interstitial silicon atoms formed near the SiO_2/Si interface during silicon oxidation.

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