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Characterization of Thick p^+ Silicon Layer for Microelectromechanical Systems

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A thick, heavily boron-doped layer (over 10 μm and over 7×10^{19} cm^{-3}, respectively), which is commonly used as an etch-stop for ethylenediamine-pyrocatechol-water (EDP) etching, was characterized experimentally. Thermal boron diffusion was carried out using a solid source at 1125°C for 7 to 25 h. The experimental results showed that sheet resistance in the heavily boron-doped layer was inversely proportional to the thickness of the etch-stop layer.

1. Introduction

Heavily boron-doped silicon layers (referred to as p^+ or etch-stop layers) are used extensively as etch-stops for KOH, ethylenediamine-pyrocatechol-water (EDP) and other anisotropic etchants to fabricate microelectromechanical systems (MEMSs). The p^+ etch-stop is an important technology in the field of silicon microtransducers; several mechanical properties of the p^+ layer, such as surface roughness and residual stress have been studied.[1,2] Recently, a p^+ layer 10 to 15 μm thick was used to develop various kinds of MEMSs.[3,4] However, there are few reports on the characteristics of p^+ layers over 10 μm in thickness. This paper reports the experimental data on fabrication and attempts to characterize the thick p^+ layer for MEMSs.