Novel Method for In-Situ Monitoring of Thickness of Silicon Wafer during Wet Etching

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In this investigation, we developed a plate wave sensor made on a Li-doped ZnO piezoelectric film for monitoring the thickness of a silicon membrane in real-time during wet etching. A novel method, which differs from any presented in previous work on etch-stop techniques, is developed to monitor in-situ the thickness of a silicon membrane during wet etching. In this work, in which the design wavelength of the interdigital transducers (IDT) is 40 µm, the method presented for measuring the thickness of a silicon membrane from 20 µm to 40 µm in real-time is highly accurate and simple to implement. Based on the same methodology, the proposed plate wave sensor also allows the thickness of a silicon membrane to be monitored from a few µm to hundreds of µm in-situ, depending on the periodicity of the IDT. The principles of the method, the detailed fabrication flow, the setup for monitoring the thickness and the simulation and experimental results are all addressed. The theoretical and measured values differ by an error of less than 1.50 µm and are very close to each other.

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