## Documents

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**Simulation and Analysis of Piezoresistive Microcantilever**
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**Abstract**
Currently, most piezoresistive microcantilever sensors are configured with a dual-layer design that includes a piezoresistor integrated onto the upper surface of a microcantilever. The dual-layer design effectively enhances sensitivity and the piezoresistance effect. However, integrating the piezoresistor onto the microcantilever in the fabrication process necessitates additional steps, leading to extended manufacturing times and increased production costs. In this paper, the mechanical behavior of a single-layer piezoresistive microcantilever, namely displacement, stress, and strain, is investigated and analyzed using ANSYS Multiphysics. The contributing factors expected to affect the device's performance are its geometrical dimensions, and the materials used. Regarding the device dimensions, the length, thickness, and width of the cantilever were varied. It was found that the performance of the piezoresistive microcantilever can be improved by increasing the length and decreasing the thickness. The displacement of the microcantilevers increased by about 230%, from 75.76µm to 250.12µm, when the length was increased from 225µm to 350µm. The applied force ranged from 2uN to 12uN. Similarly, the stress and strain produced on the microcantilevers also increased by about 60.83% and 57.22%, respectively. From the material point of view, the microcantilever made with silicon always had the highest displacement value compared to silicon nitride, silicon dioxide, and polysilicon. This is due to the Young's modulus value, where materials with lower Young's modulus will have higher displacement and stress. 

**Author Keywords**
ANSYS; microcantilever; Piezoresistive

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