The Role of SU8-2025 Polymer in the Development of MEMS Acoustic Sensor

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Abstract

In development of Micro-Electro-Mechanical Systems (MEMS)-based devices, polymer has become an important material because of its ease of fabrication, low cost and great variety of functionalities. The SU-8 is a polymer which is often used in fabrication of MEMS devices and have applications in making the high-aspect ratio type structures. The material can be used as a photo-resist sacrificial mask and a building block for High Aspect-Ratio (HAR). In the present approach, SU-8 2025 was used to fabricate a microtunnel for MEMS acoustic sensor. The MEMS acoustic sensor consists with a piezoelectric layer sandwiched between two aluminum electrodes on a thin silicon diaphragm made using bulk micromachining technique. In the structure, a microtunnel is fabricated which relates the diaphragm cavity to the atmosphere for pressure compensation. It is basically, decides the lower cut-off frequency of the device. Also, it is used to protect the silicon diaphragm when high sound pressure applied on it. The fabricated acoustic sensor is used to measure the sound pressure level between 120 dB to 180 dB in wide frequency range 30 Hz to 8 kHz. The sensitivity of the sensor was measured and found to be 380 μV/Pa [1]. The role of SU8-2025 is demonstrated which drastically reduced the process steps and save the power during fabrication of device [2]. The SU8-2025 is used to cover the entire microtunnel cavity made using bulk micromachining technique during window opening for diaphragm fabrication. The polymer protects the thermally grown silicon dioxide in microtunnel cavity during silicon dioxide removal from diaphragm area. The coverage of microtunnel cavity results in successful merging of microtunnel in diaphragm cavity for MEMS acoustic sensor. Finally, a pyrex glass is anodically bonded with fabricated acoustic sensor wafer to seal the microtunnel cavity. The dicing of bonded wafer was performed in such a way that it's opened the microtunnel mouth to the atmosphere for pressure compensation.

References:

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