

Towards Sensors Implementation and Integration Using the CMOS MEMS Platform

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The CMOS-based micro fabrication technology provides a promising approach to implement MEMS devices. Such process technology, also named as CMOS MEMS, enables the monolithic integration of ICs and micro mechanical components. Moreover, the mature CMOS fabrication processes are available in existing IC foundries. Presently, various CMOS-based MEMS sensors and actuators have been extensively investigated. Commercial CMOS MEMS products such as inertial sensor, humidity sensor, microphone, etc. have also been reported. This presentation will introduce novel double-side CMOS post-processes established by the speaker's group (Fig.1) to realize various capacitance type CMOS MEMS sensors. In applications, the design and monolithic integration of various capacitive sensors, such as 3-axis accelerometers, pressure sensors, tactile sensors, magnetic sensors, etc. using the standard TSMC 2P4M CMOS process will be demonstrated (Fig.2). Various post-CMOS processes will also be introduced to show other potential applications of the CMOS MEMS technology. Sensors implementation and monolithic integration can thus be achieved. In summary, the presented CMOS MEMS platform shows a promising architecture for the existing CMOS technology while moving towards the era of "More than Moore."

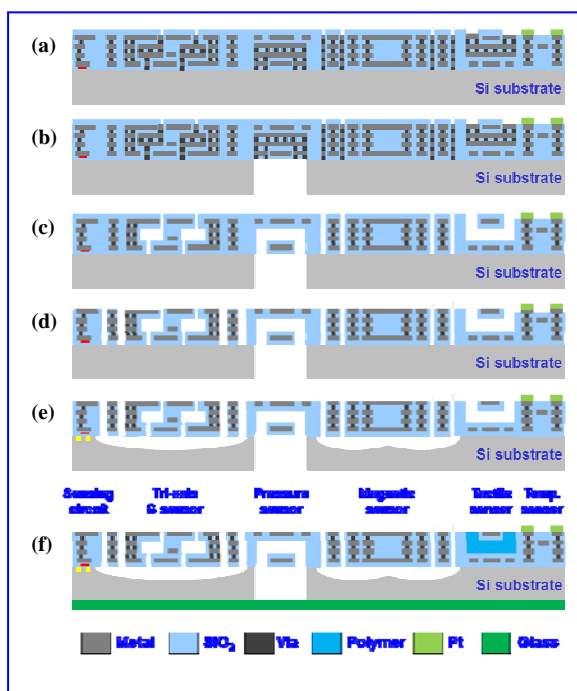


Fig.1 The fabrication steps for CMOS post-process: (a) standard CMOS stacking, (b) backside DRIE etching, (c) metal wet etching, (d) RIE etching, (e) XeF₂ releasing, and (f) backside bonding.

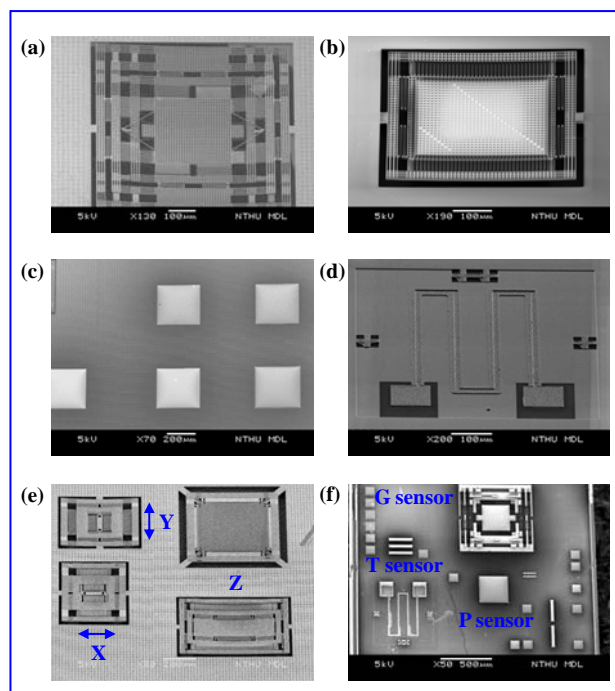


Fig.2 The micrographs of CMOS MEMS sensors: (a) 3-axis accelerometer, (b) magnetic sensors, (c) pressure sensor, (d) temperature sensor, (e) multi 1-axis accelerometers, and (f) G/P/T sensors integration.