

Layer thickness sensor for the detection of layer depositions in process chambers

Graduate



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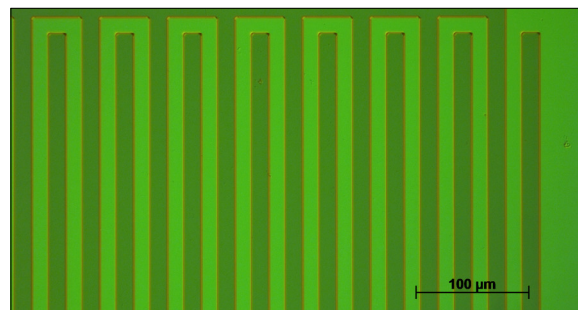
Initial Situation: In the precise structuring of semiconductor wafers for the production of integrated circuits, plasma etching processes are of crucial importance. One of the issues during processing involves the formation of residues on the inner walls of the process chambers. During processing, particles can be released from the deposits. These particles can lead to defects on the wafers. In order to prevent excessive layer buildup on the chamber walls and avoid associated problems, regular cleaning and conditioning of the process chambers are essential. As part of the bachelor's thesis, a capacitive sensor system for the detection of layer depositions in process chambers to support the cleaning and conditioning processes was to be developed.

Approach: The processes developed in the previous specialized module were implemented during the bachelor's thesis in the cleanrooms of OST. The structures were created using photolithography and etching processes. The functionality was validated through capacitance measurements and vacuum leak tests. The layer deposits for the capacitance measurements were simulated by applying photoresists.

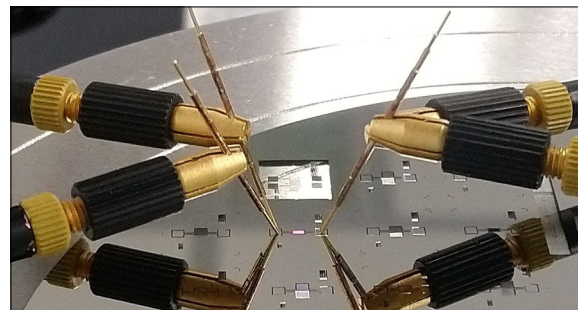
Result: Finally, sensors with a total of twelve different designs were successfully realized, with the smallest structures measuring only 2 μm in size. Vacuum leak tests indicated that the housing is sufficiently airtight for use in coating and etching systems. Capacitance measurements demonstrate that the sensors can reliably provide reproducible values, enabling inference of the applied layer thickness. The larger structures yielded particularly stable results. While the costs were only roughly estimated within the scope of the bachelor's thesis, it became evident that production in larger batches and the adjustment of

certain process parameters have significant potential for cost savings.

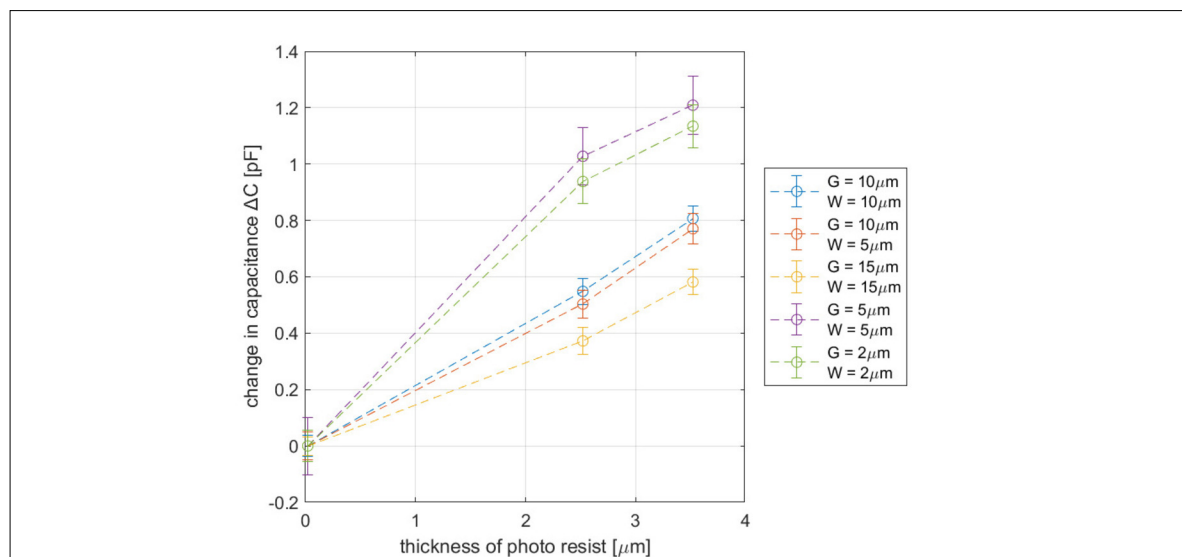
Section of a microstructure. Interdigital electrode with a finger width of 15 μm .
Own presentation



Capacitance measurement of the microstructure with a needle probe at 1.25 V and 100 kHz.
Own presentation



Sensors with variable electrode width W and air gap width G show different sensitivities.
Own presentation



Advisor

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Subject Area

Microtechnology