STUDY OF THE YOUNG'S MODULUS IN MICROSTRUCTURES THROUGH THE RESONANCE FREQUENCY TECHNIQUE FOR APPLICATIONS IN COMMERCIAL PROCESSES OF MANUFACTURING IN MICROELECTRONICS

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The foundries generally provide the electrical characteristics of the layers of their manufacturing processes, but they do not provide the mechanical parameters, which prevents the mechanical optimization of any design used in this manufacturing. In addition, many foundries insert thin layers of titanium nitride between the metal layers of their processes, which may be a factor influencing changes in the mechanical properties of the metal layers. Thus, the extraction of mechanical properties from the layers of a commercial process is important, however, it is not done directly and requires specific techniques and microstructures for this purpose. This work presents a study on the Young's modulus of cooper thin films using the resonance frequency technique [1] to extract this parameter. The microstructures used for the application of the technique were cooper cantilevers suspended in such a way that it was possible to measure their resonant frequency, being analyzed cantilevers with and without the thin layers of titanium nitride on them. These structures were also simulated using the finite element method. The experimental results were compared with the simulations and presented equivalence. The Young's modulus of copper was extracted, and it was concluded that the titanium nitride layer can affect this parameter, depending on its thickness.

[1] Kurt E. Petersen, C.R. Guarnieri, Journal of Applied Physics, v. 50, (1979), p. 6761-6766.