

Process parameters optimization for MEMS-like microcells as physical packages applied to time and frequency metrology - METROLOGY - Quantum application

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Microfabricated vapor-cells filled with alkali atoms represent the core component of a new generation of miniaturized quantum sensing devices based on frequency references. MEMS-like technology is leading to a fundamental breakthrough in terms of hot atomic alkaline vapors confinement in cubic millimeters volume (in vacuum or in presence of a buffer gas). However, some issues related to microcells design, filling process and reproducibility need to be addressed by optimizing the multiple process steps.

In this talk we pass through the main steps of the process flow for the fabrication of MEMS- like microcells reporting in detail the optimization of each step without leaving aside the failures. It includes the design of layout choice, the photolithography dose test study, the alkali atoms filling methods and the anodic bonding process. A particular focus is reserved for the ICP - Deep Reactive Ion Etch process, highlighting as the mask nature can dramatically affect the etch of 1mm silicon.