MEMS-like alkali vapors cells fabrication and characterization for quantum sensing devices

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Microfabricated alkali vapor cells constitute the main build blocks of the increasingly on demand chip-scale atomic devices based on the quantum sensing of atoms in the optical and microwave range, such as optical atomic clocks, magnetometers, gyroscopes, and electric field sensors. The most promising and robust strategy to produce the alkali vapor cells, with volume size around few millimeters, is based on MEMS technology and relies on the realization of a 3D glass-silicon-glass anodically bonded structure. The silicon wafer design involves the creation of numerous pairs of passing cavities via DRIE plasma etch, where one cell is used for the precursor deposition and the other for the quantum sensing; the atomic vapor filling takes place in an inert environment by means in situ dispensing of a stable precursor. In this contribution, the main experimental advantages and drawbacks of different filling methods, either with Rb dispensers or with in-situ reaction, as well as different cell designs and details on wafer production will be discussed. Moreover, it will be presented the optical characterization of the realized MEMS-like rubidium vapor cells.