

Laser-based glass processing of vapor cell components

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As an alternative to conventional glass-blowing techniques for the manufacturing of macroscopic glass-blown cells, the structuring of transparent glass components using ultrashort laser pulses is reported here. Laser structuring by selective laser-induced etching (SLE) is a laser technology for the transfer of cavities, channels or other structures into transparent glass components up to a thickness of 10 mm. This precise structuring enables the fabrication of all-glass atomic vapor cells. Similar to microfabricated (MEMS) vapor cells, these glass-based vapor cells consist of a structured cavity glass chip which is hermetically sealed by two cover chips. The SLE process allows any three-dimensional shape of the cavity and a multi-chamber design of the cavity-chip. In order to realise the batch fabrication of the all-glass vapor cells, thin glass bridges can be structured so that separation is simplified. In addition to the production of macroscopic glass components, it is also possible to miniaturise the glass-based components. These all-glass atomic vapor cells may find application in miniaturized atomic quantum sensors.

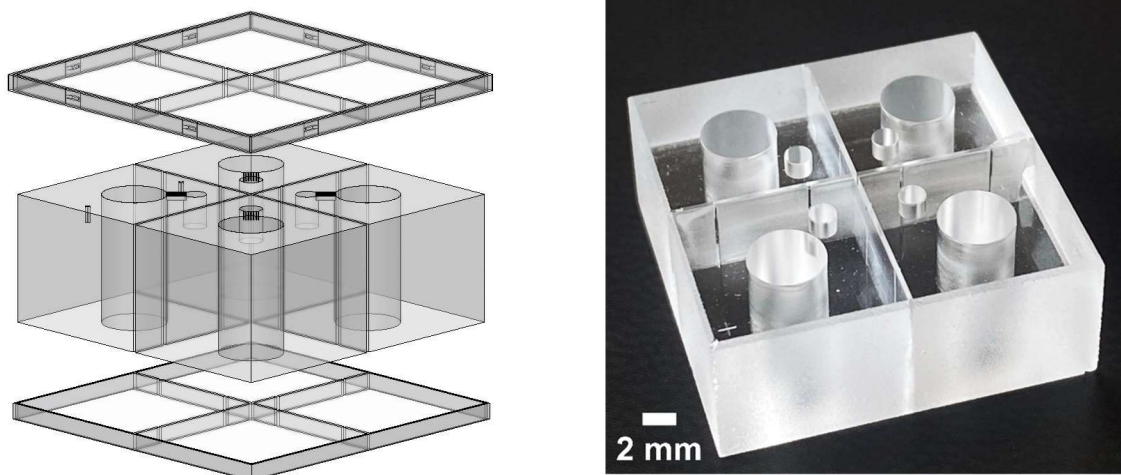


Figure 1. Design sketch of the glass-based vapor cell (left) and SLE-structured cavity chip (right)