

## Fabrication of Microcylinder on Silicon

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In this paper, we describe a new fabrication method for a round microcylinder on a silicon substrate using polyvinyl alcohol (PVA) polymer and micro-electro-mechanical system (MEMS) technology. Silicon substrate is selectively etched using a LPCVD-Si<sub>3</sub>N<sub>4</sub> mask and a HNA (hydrofluoric, nitric, acetic) acid mixture as an isotropic etchant, to fabricate the lower half of the microcylinder that has a hemicyclic cross section. PVA polymer is then selectively filled into the etched hemicyclic channel and covered by a gold layer. A following thermal treatment makes the polymer with the gold layer swell and decomposes the polymer filled in the channel when it reaches pyrolysis temperature, resulting in a cylinder-like channel. A polymer can be easily removed by heat treatment at the pyrolysis temperature so that it is used as a sacrificial layer. The fabricated microcylinder has a width of 80 μm and a length range of 100–500 μm. In principle, it is possible to control the diameter and shape of the microcylinder on demand by modifying processing conditions, such as hydrofluoric, nitric and acetic (HNA) and etching time, PVA coating, and thermal treatment. The microcylinder fabricated by this method may find various applications in the micro total chemical analysis system (μTAS) or Lab-on-a-Chip.

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