All-silica nanofluidic devices for DNA-analysis fabricated by imprint of sol-gel silica with silicon stamp.

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We present a simple and cheap method for fabrication of silica nanofluidic devices for single-molecule studies. By imprinting sol-gel materials with a multi-level stamp comprising micro- and nanofeatures, channels of different depth are produced in a single process step. Calcination of the imprinted hybrid sol-gel material produces purely inorganic silica, which has very low autofluorescence and can be fusion bonded to a glass lid. Compared to top-down processing of fused silica or silicon substrates, imprint of sol-gel silica enables fabrication of high-quality nanofluidic devices without expensive high-vacuum lithography and etching techniques. The applicability of the fabricated device for single-molecule studies is demonstrated by measuring the extension of DNA molecules of different lengths confined in the nanochannels.