

Polyimide microfluidic devices with integrated nanoporous filtration areas manufactured by micromachining and ion track technology

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This paper reports on polyimide microfluidic devices fabricated by photolithography and a layer transfer lamination technology. The microchannels are sealed by laminating an uncured polyimide film on a partially cured layer and subsequent imidization. Selected areas of the microchannels were irradiated with heavy ions of several hundred MeV and the generated ion tracks are chemically etched to submicron pores of high aspect ratio. The ion beam parameters and the track etching conditions define density, length, diameter and shape of the pores. Membrane permeability and separation performance is demonstrated in cross-flow filtration experiments. The devices can be used for selective delivery or probing of fluids to biological tissue, e.g. drug delivery or microdialysis. For chip-based devices the filters can be used as a sample pre-treatment unit for filtration or concentration of particles or molecules.