Microfabricated Intrachannel Connections for Controlling Material Transport

Stephen C. Jacobson, Christopher T. Culbertson, Julia Khandurina, Roswitha S. Ramsey, and J. Michael Ramsey,
Oak Ridge National Laboratory, Oak Ridge, TN 37831-6142, USA

The ability to control the electric potential at any point within a microfabricated fluidic network enhances the operability of the device. An early approach was to use thin metal films for electrical contacts, but due to electrolysis, bubbles were generated at the electrode and in turn disconnected the electrode from the buffer solutions. We have investigated several techniques for forming intrachannel electrical connections that circumvent electrolysis issues. These connections allow efficient small ion transport for electrical conduction but minimize or inhibit bulk fluid transport. The electric potential is applied to the reservoir and is coupled to the other channels through a control channel. Electroosmotically induced pumping, differential ion transport, and sample enrichment have been demonstrated with various types of intrachannel connections.

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