Capillary gap sampler: low-volume and fast sampling platform directly coupled to ESI-MS

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This project aims at the development and implementation of a “capillary gap sampler”- a miniaturized sampling device as a platform for directly connecting microfluidics to µ-ESI-MS for fast sample analysis. Important requirements for the sampler design come from an increasing interest in both site-specific sample pickup (e.g., for imaging applications) and for improved productivity in resource-saving screening procedures. The basic idea consists of creating an“ open” system for sample infusion, by forming a liquid bridge of several nanoliters within a micrometer-sized gap between two capillaries. A solid pin is used for sample uptake and delivery.The system shows good performance characteristics such as sensitivity, response linearity, and robustness for multiple sample analysis.This device thus has the potential for rapid analysis of biomedical and pharmaceutical samples with limited sample amounts in a high-throughput mode.

We present a monolithic design so called “semi open capillary” to address challenges for keeping the liquid bridge stable. Geometry of the semi open capillary is optimized in order to achieve minimum sample dilution. RSD for 28 injections is less than 20 %, confirming the good repeatability of the performance. Less limitations in terms of different operating chamber pressure and flow rate are the main advantages of the new design. Being quicker to operate and being less sensitive to the fluctuations in flow rate and chamber pressure makes the system more robust, thus more useful for wider range of applications.