

Ion Focusing in a Micro Time-of-Flight Mass Spectrometer

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Micro Electro Mechanical System technology (MEMS) is an attractive way for mass spectrometer miniaturization. MEMS technologies, developed by the micro-electronics industry, result in a number of technical constraints (material selection, structure geometry). For example lens presented square section, also structures must be adapted to MEMS technologies and setting must be based on simulations.

Architecture that we have retained is a Time-Of-Flight (TOF) μ -SM. These structures have a maximum size of only 1.5 cm \times 3 cm. μ -TOF devices exist two versions: a linear version with a linear flight of ion and a version engineered with an orthogonal injection and a reflectron. Ionization is made by Electron Impact, with filament or by electron beam.

First evaluations were conducted on linear TOF to test ion extraction and ion beam focusing, through adjustments of tension setting on focusing lens. These tests were compared with simulations (software Simion 8.0). Impact of electric settings on dispersion and width of ion beam are followed and experimental results are compared with ion flow simulations (Simion 8.0). Different configurations e.g. using Einzel-lens and other methods, are tested to determine the best focus configuration and the highest transmission ion rate.

In view of expected efficiency and resolution, the device is designed to be hyphenated with a micro gas chromatography (μ -GC) currently under development, based on MEMS technology also.