Drop-on-demand aerosol generator for ICP-MS analysis

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Marine iodine species seem to have great influence on particle formation processes in the atmosphere *(Gilfedder, BS; Lai, SC; Petri, M; Atm. Chem. Phys., 8, 6069-6084, 2008), but* only few species could yet be identified. Due to very low concentrations of these species, high efficient sample introduction systems for plasma-source mass spectrometers need to be used. However, the introduction of liquid samples into analytical plasmas is still the Achilles's heel in the field of inorganic trace and especially speciation analysis, which is commonly established through the continuous generation of aerosols via pneumatic nebulization. It is well known that this aerosol not only shows a relatively broad particle size distribution but mostly also results in a too high load for the plasma source and is thus not suitable for direct introduction into the ICP. Various spray chamber designs – optimized e.g. for maximum sensitivity or minimum dead volume and wash-out times – serve to overcome this problem, allowing only the small-sized droplets to pass to the plasma source. Unfortunately, this might also result in an unfavourable loss of sensitivity.

Hyphenated techniques are an essential tool in modern elemental speciation analysis. In particular when hyphenating liquid chromatography (e.g. HPLC or IC) and capillary electrophoresis (CE) to plasma source mass spectrometry the efficient nebulization of very small liquid volumes is indispensable, because of low eluent volume flow rates, which necessitates special low-flow and micro-flow nebulizer/spray-chamber systems. Therefore, the generation of small and preferably monodisperse droplets from liquid samples for elemental trace and speciation analysis is of common interest.

In this poster we present a novel approach in generating aerosol from very small liquid sample volumes by applying a new *drop-on-demand* aerosol generator based on thermal-inkjet technology. The software independent design of a micro-controller allows easy regulation of droplet generation frequency as well as droplet diameter and overall flow rate. The new system may be suitable to overcome weaknesses of current hyphenating techniques like e.g. post column dilution in CE or the generation of additional noise, stemming from pumps, necessary for the delivery of the mobile phase in HPLC and the make-up liquid in CE. Also, matrix effects from organic species might be less important, because the overall solvent load of the plasma is reduced. The new aerosol generator will be characterized and its potential as a nebulizer for ICP-MS-based analysis of different marine iodine species will be outlined.

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