ENHANCING SAMPLE TRANSPORT EFFICIENCY USING AN OPTIMIZED INFRARED-HEATED SAMPLE INTRODUCTION SYSTEM FOR THE ANALYSIS BY SINGLE-PARTICLE INDUCTIVELY COUPLED PLASMA MASS SPECTROMETRY

Single particle inductively coupled plasma mass spectrometry (spICPMS) is a powerful approach for characterizing nanoparticles, microplastics, and even individual cells. In theory, only one particle is introduced to the plasma at a time, and the corresponding signal would shown the elemental composition of this particle. However, the sensitivity and detection limits of spICPMS are often constrained by the low transport efficiency (TE) of conventional sample introduction systems [1]. Enhancing TE is critical for maximizing detection capability and minimizing sample consumption, particularly when working with valuable samples like cells [2]. Total-consumption systems have shown promise, achieving 100% TE for nanoparticles using infrared (IR)-heated spray chambers [3].

In this study, an IR-heated sample introduction system was optimized for single particle analysis, and multiple optimization strategies were systematically evaluated. The optimization focused on improving analytical sensitivity and TE across a range of particle types, with performance compared against commercially available sample introduction systems. The optimized setup will subsequently be integrated with flow injection and monosegmented flow analysis to assess whether additional gains in TE and overall analytical performance can be achieved.

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