Size resolved elemental analysis of bimetallic nanoparticles using SMPS-ICP-MS

A. Agarwal[1,2,*], **L. Torrent**[1], **C.D. Koolen**[3,4], **A. Züttel**[3,4], **C. Ludwig**[1,2]

* ayush.agarwal@epfl.ch

(1) Bioenergy and Catalysis Laboratory (LBK), Energy and Environment Research Division (ENE), Paul Scherrer Institute (PSI), 5232 Villigen PSI, Switzerland

(2) School of Architecture, Civil and Environmental Engineering (ENAC IIE GR-LUD), École Polytechnique Fédérale de Lausanne (EPFL), 1015 Lausanne, Switzerland

(3) School of Basic Sciences (SB ISIC LMER), École Polytechnique Fédérale de Lausanne (EPFL) Valais/Wallis, Energypolis, Sion 1951, Switzerland

(4) Empa Materials Science and Technology, Dübendorf 8600, Switzerland

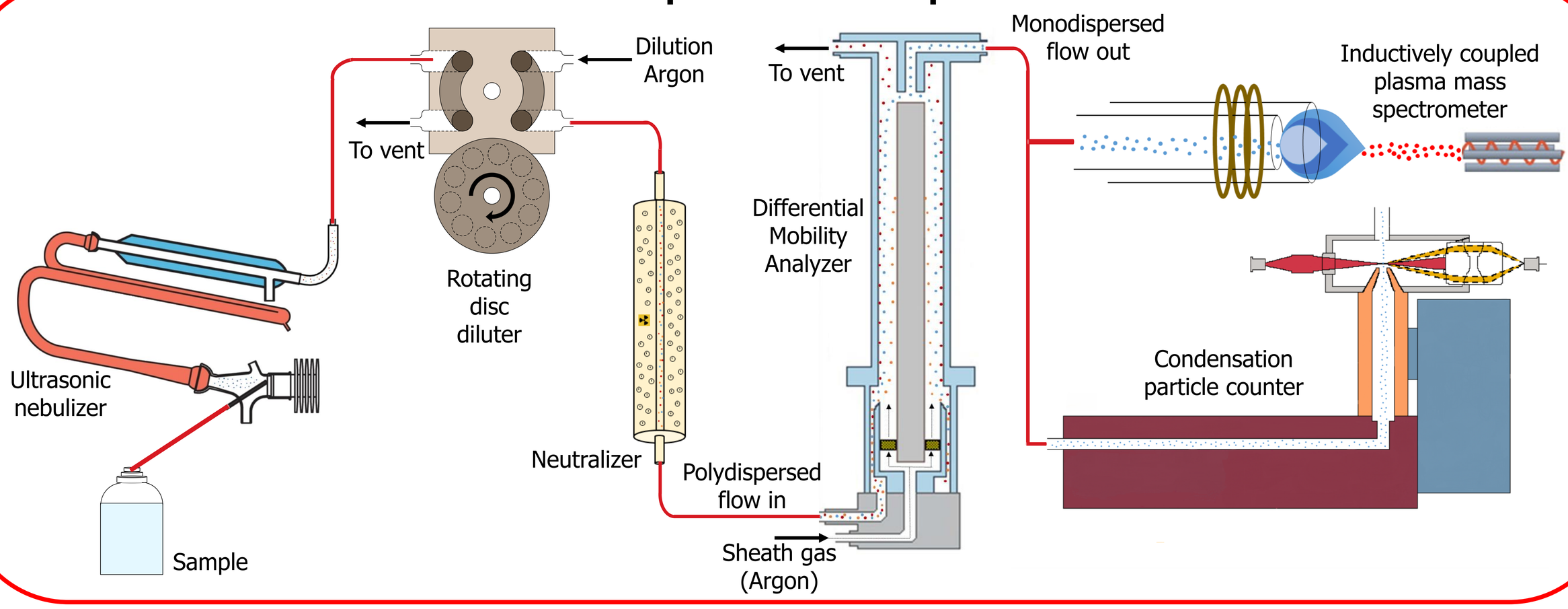
26th ETH-Nanoparticles Conference (NPC-23)

Poster: P58

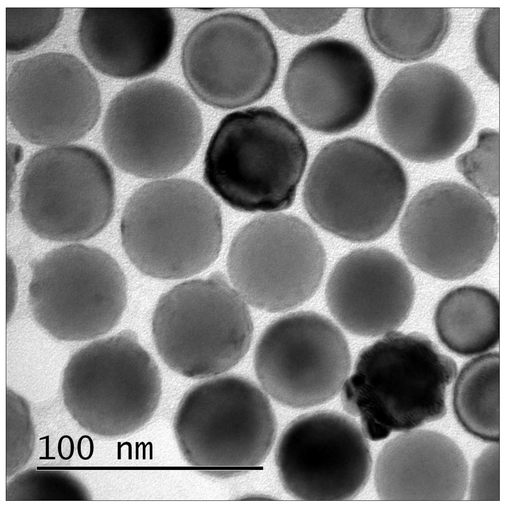
Introduction

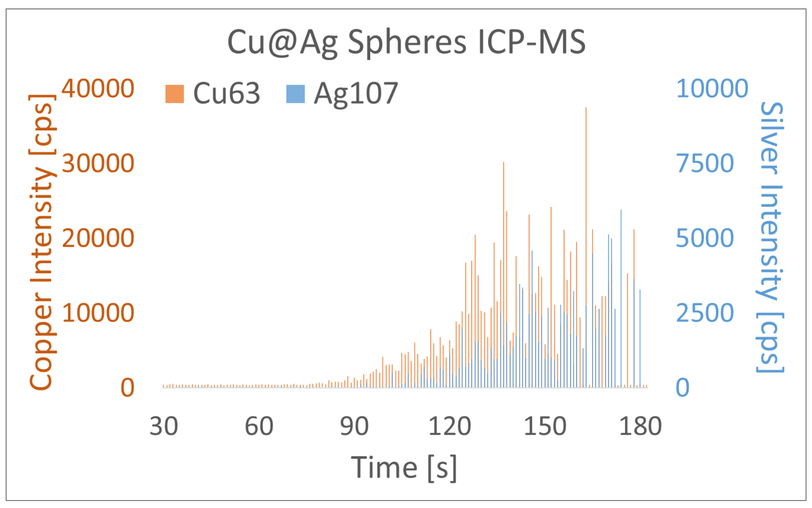
Analysis of nanoparticles (NPs) is crucial for understanding their potential impact on human health and the environment. Key parameters such as number concentration, size distribution, and chemical composition play a vital role in assessing the behavior and toxicity of these particles. The combination of the Scanning Mobility Particle Sizer (SMPS) and the Inductively Coupled Plasma Spectrometry (ICP-MS) is presented as a novel setup for comprehensive analysis. The SMPS enables the determination of particle size distribution and number concentration, while the ICP-MS provides elemental particle composition information. By coupling these two techniques, simultaneous data on both particle size and chemical composition can be obtained, allowing for a deeper understanding of particle characteristics.

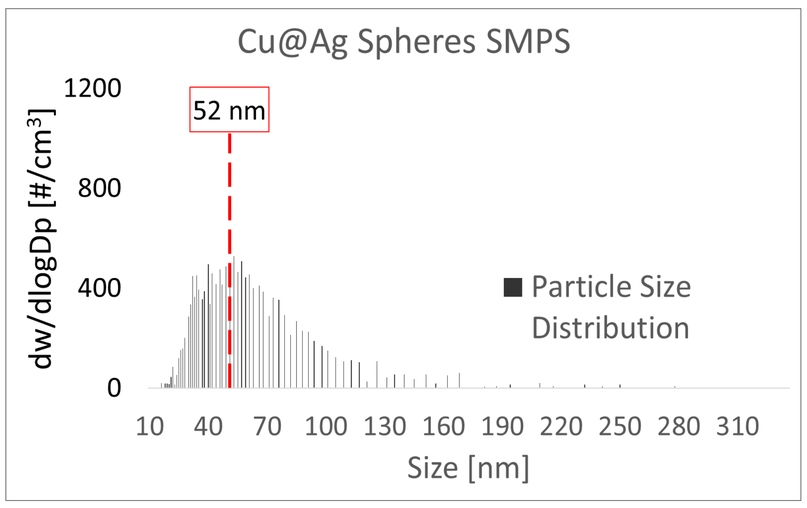
Experimental Setup

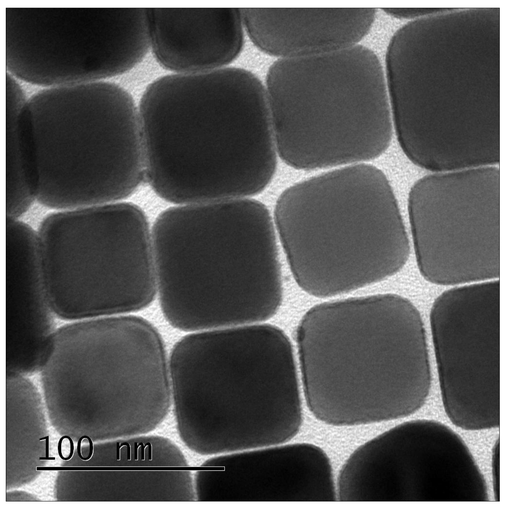


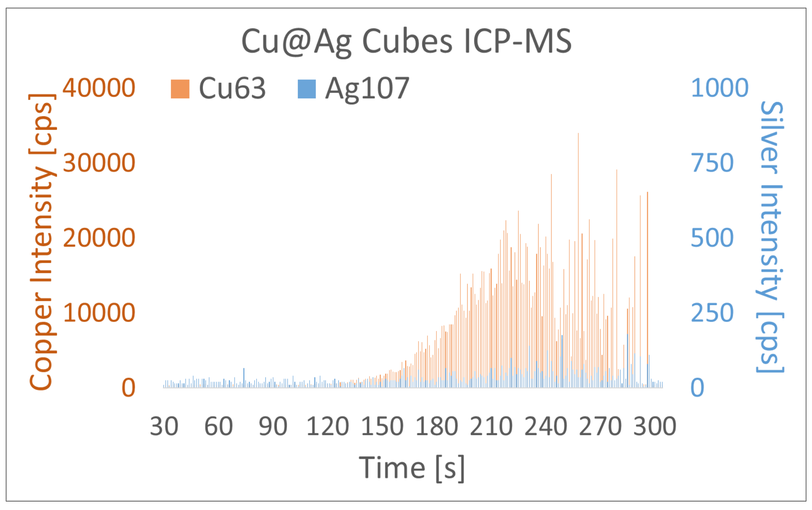
Preliminary Results

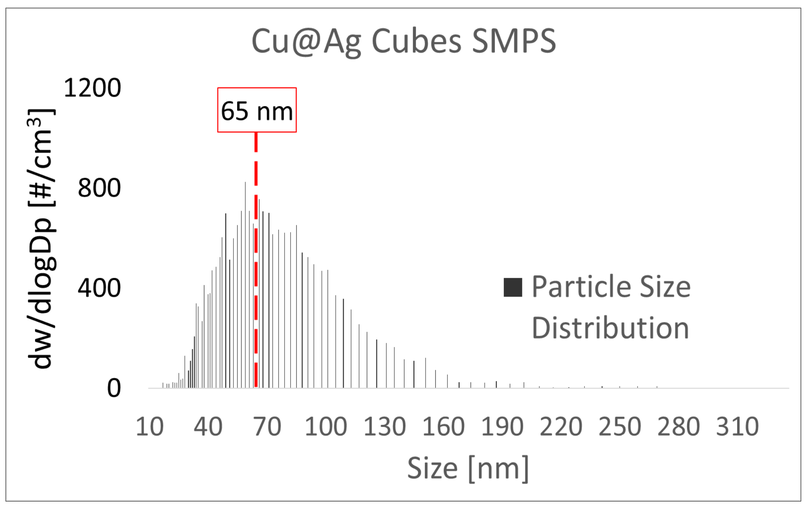












Conclusions

- This study demonstrates the use of SMPS-ICP-MS to conduct a high throughput sizing, counting, and elemental analysis of multimetallic NPs.
- The findings suggest that SMPS-ICP-MS has the potential to be a complementary analytical tool for characterizing NPs in suspensions and aerosols.

Acknowledgements: Financial support was obtained from Swiss National Science Foundation (SNF Project 184817), the ESI platform at Paul Scherrer Institute, and the Board of the Swiss Federal Institute of Technology (SynFuel Initiative).