

Behaviour of ZnO nanoparticles during high temperature treatment: on-line, size-resolved elemental analysis

D. Foppiano^{a,b}, M. Tarik^a, A. Hess^a, E. Müller^a, C. Ludwig^{a,b}

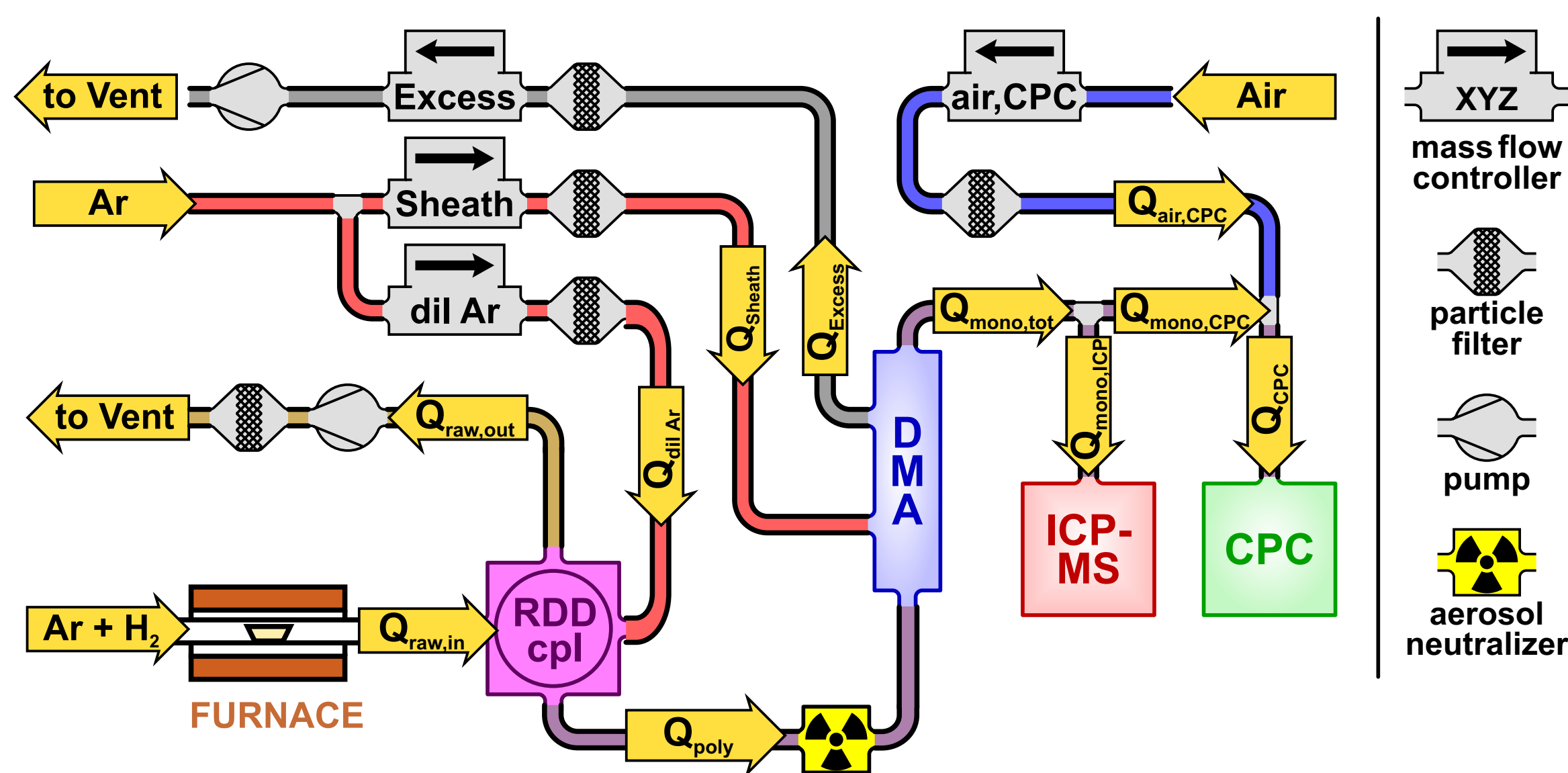
^a Paul Scherrer Institut (PSI), Switzerland

^b École Polytechnique Fédérale de Lausanne (EPFL), Switzerland

Motivation

- Fate of metal nanoparticles in incinerator plants: heavy metals may volatilize and re-form as incidental nanoparticles after filtration of the flue gas
- ZnO nanoparticles used in paints and waterproofing agents (used as wood preservatives)

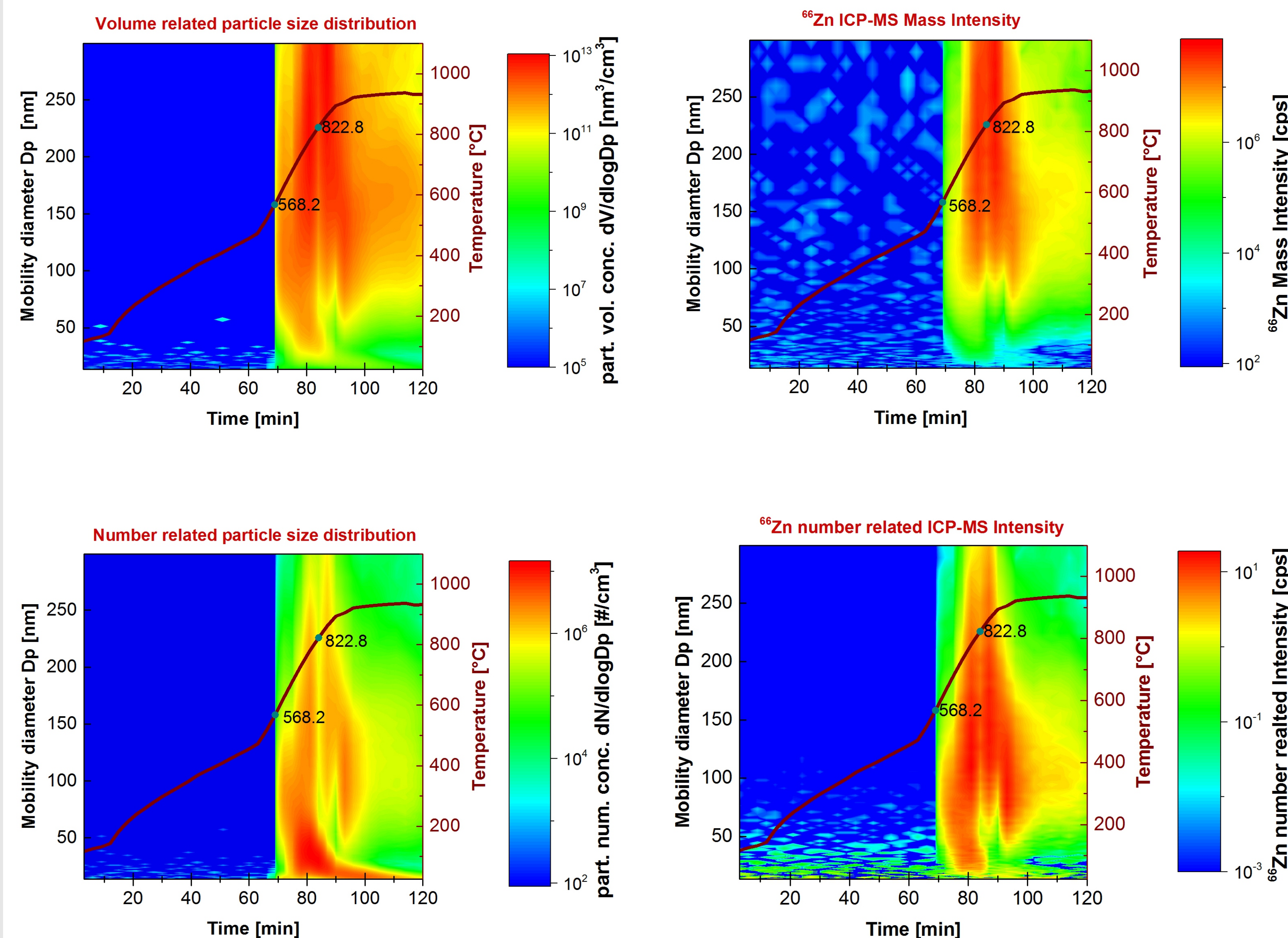
Measuring Arrangement : RDD-SMPS-ICP-MS



- **RDD**: adjustable and high dilution ratio and well-defined flows of the aerosol
- **SMPS**: online analysis of size distribution and concentration of particles
- **ICP-MS**: online elemental analysis (chemical composition)
- Thermal treatment of ZnO nanopowder in a tubular furnace

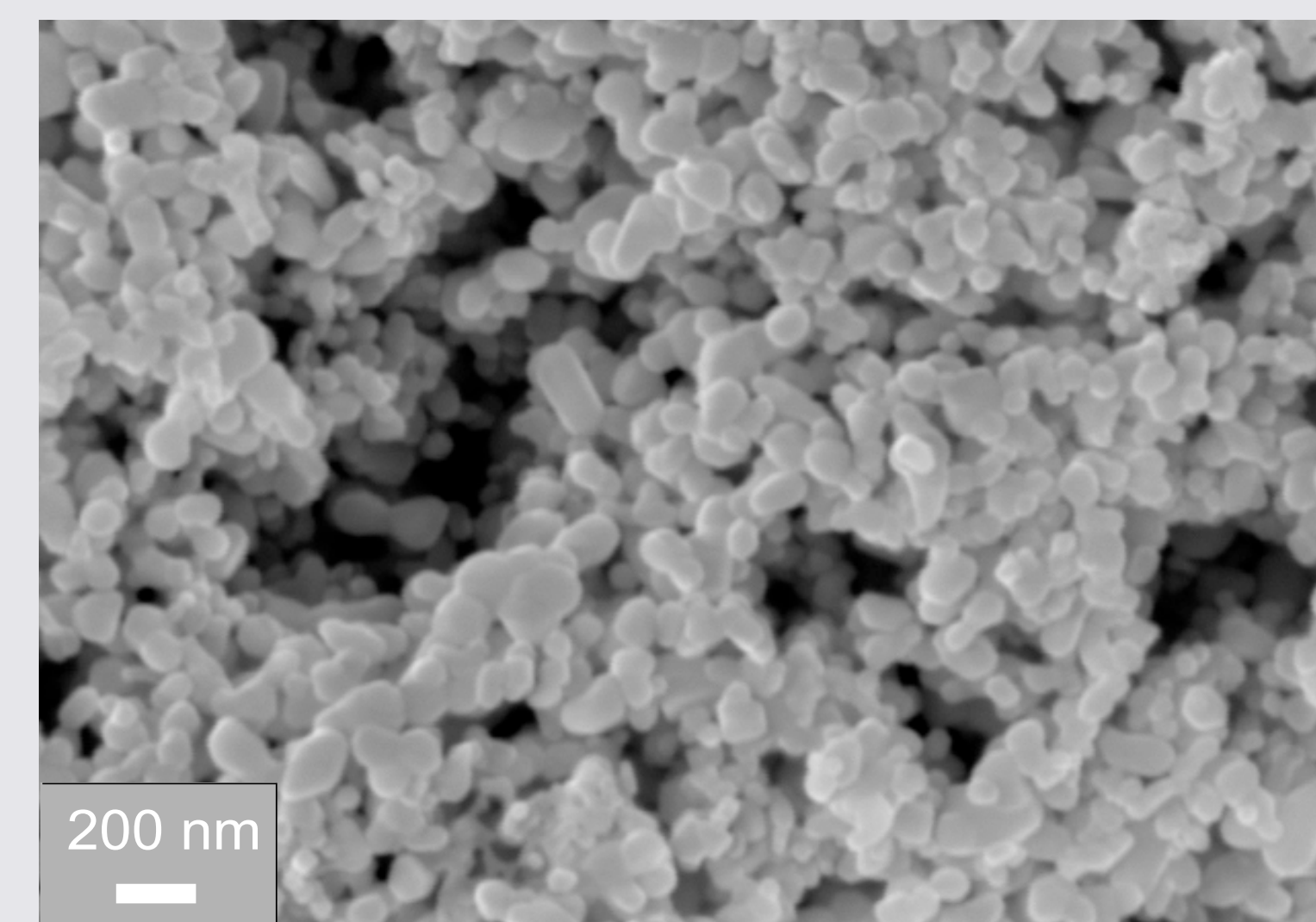
Experimental Data

SMPS-ICP-MS

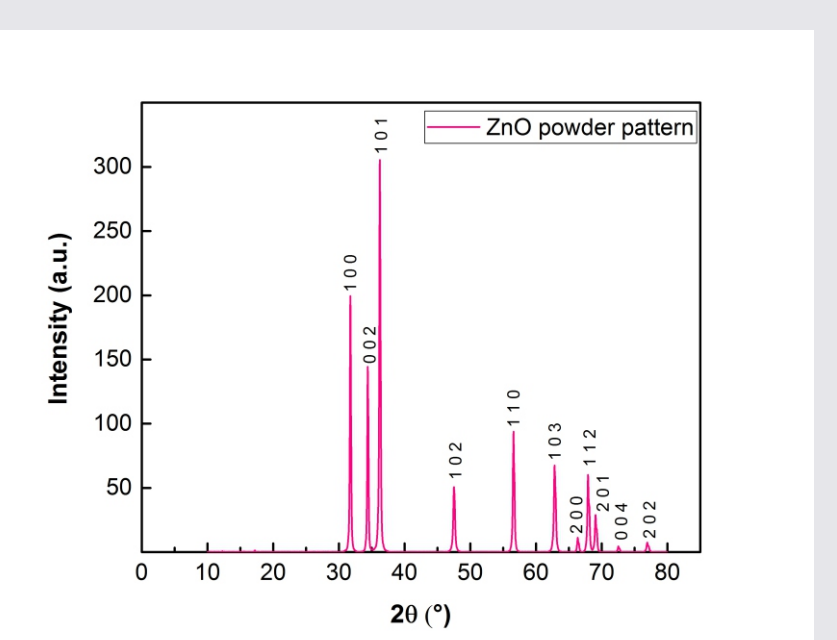


ZnO nanoparticles detection with SMPS-ICP-MS in the range of 50 - 290 nm

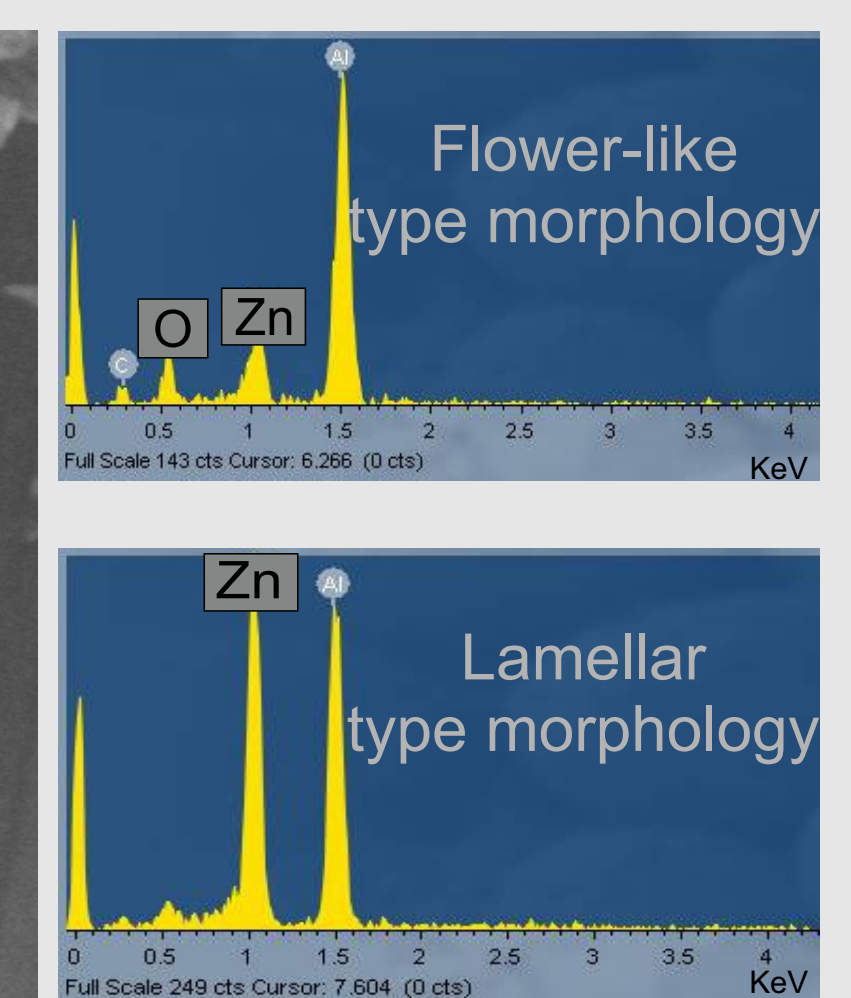
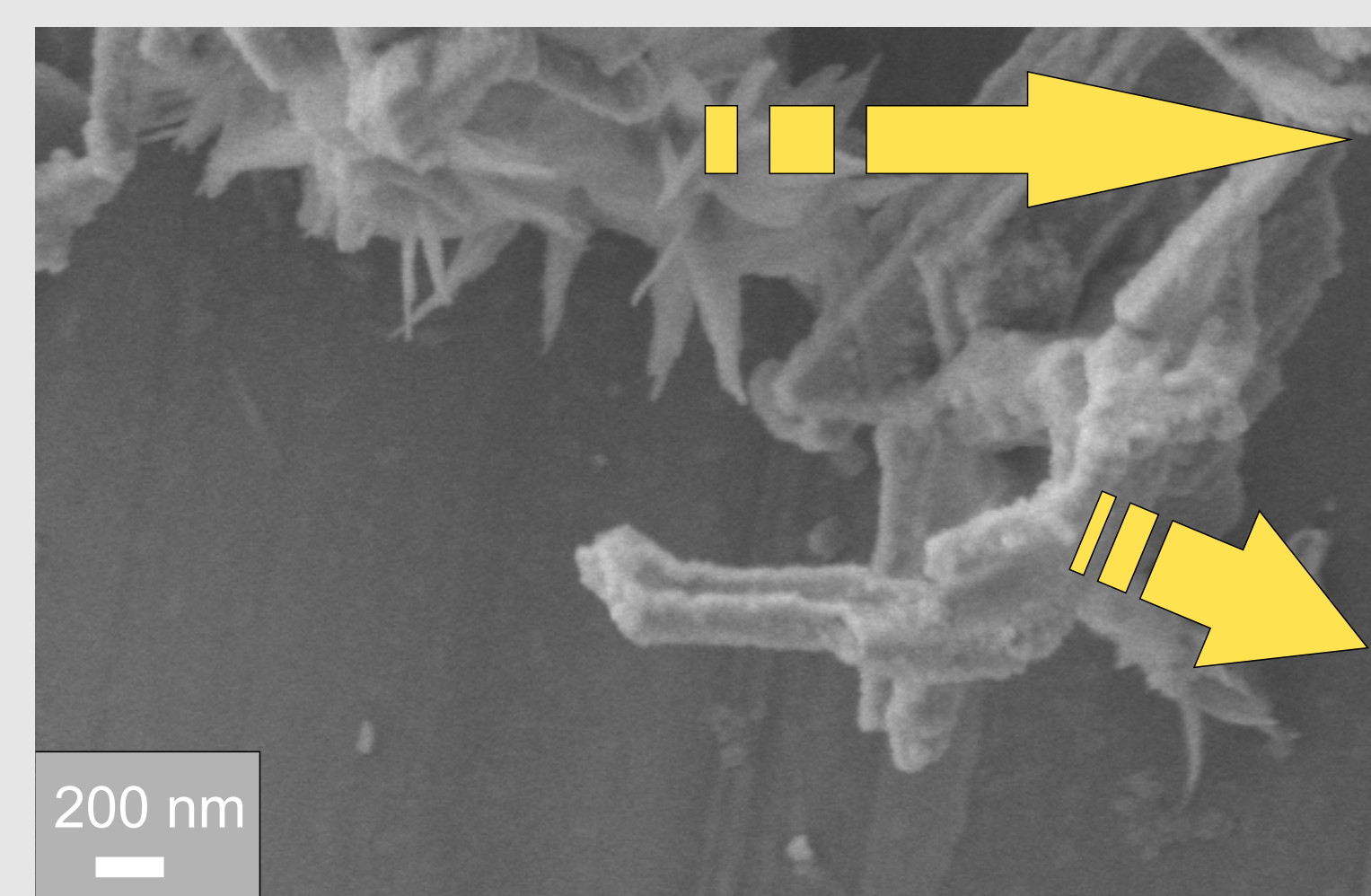
SEM and XRD analysis on ZnO powder



Nearly spherical morphology
Hexagonal crystalline structure



SEM and EDX analysis (after thermal treatment)



Analysis on remaining powder, after thermal treatment

Conclusion

- Detection of Zn containing nanoparticles during high temperature treatment in reducing atmospheres
- Preliminary results for wood combustion: reducing conditions can influence the release of nanoparticles containing redox-sensitive elements, such as Zn

Acknowledgements

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