ANALYSIS OF ATMOSPHERIC AEROSOLS AND CELL CULTURES WITH SR-TXRF: NEW DIRECT CALIBRATION USING PICO-DROPLETS (pL) GENERATED BY INK-JET PRINTERS AND SPECIATION OF IRON WITH SR-TXRF XANES

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In SR-TXRF the outstanding features of synchrotron radiation such as natural collimation, high intensity and low background allow for the detection of trace and ultra trace absolute amounts (pg, fg) of most medium Z elements. In atmospheric aerosols and biological samples, amounts are limited and the determination of very low absolute amounts of elements is required. However, an accurate and reliable calibration of SR-TXRF analysis of particulate samples until now is often problematic. As calibration with nano-droplets (10-50 nL) was found to give excellent results in the determination of trace impurities with TXRF in semiconductor material [1, 2], we developed a calibration suitable for atmospheric aerosol analysis with SR-TXRF by decrease in volume to the pico-droplet (pL) range. Ink-jet printers are used to generate 5 to 130 pL droplets. This new calibration technique was applied to elemental determination in atmospheric aerosol samples and cell cultures fed with vanadium coordination compounds that act as insulin mimetic reagents. Trace components in aerosol samples as well as the uptake of vanadium in cells were successfully studied even at very low concentrations [3].

In atmospheric aerosol research, element speciation is important to assess their origin, toxicity and potential to influence climate processes. A major challenge in element speciation is to avoid chemical transformation during analyses. This easily occurs during sample preparation as used e. g. in fractionated solvent extraction or in applying chromatographic techniques. XANES measurements allow element speciation without dissolving the samples. As Si-wafers can be used as aerosol collection plates in an impaction device and as sample carrier for XANES measurements, no additional step is necessary for sample preparation. Still there could be changes in element speciation during storage. Therefore the stability of iron species in atmospheric aerosol samples stored under different conditions was studied and results of the aforementioned methodological developments will be presented.