

Multiphase LA-ICP-TOFMS mapping at Mpx/hr rates

MARTIN RITTNER¹, ANDREAS SCHWEIKERT¹, DAVID
DOUGLAS² AND BENICE PAUL³

¹TOFWERK AG

²Elemental Scientific Lasers

³Elemental Scientific Inc

Presenting Author: andreas.schweikert@tofwerk.com

To achieve ever faster mapping analyses of geological samples at ever higher spatial resolutions, the technical challenges of reduced wash-out time, aerosol dispersion, small laser ablation spots, and the instrument sensitivity of the employed ICPMS pose the major constraints. Here, we present current advancements in LA-ICPMS mapping capabilities of an ICP-TOFMS (icpTOF by TOFWERK AG, Switzerland) coupled to an 193 nm excimer laser ablation system (imageGEO by ESL, USA). Mineral phases in the image are distinguished by PCA and k-means clustering, which allows to treat them individually in further data analysis and quantification.

In this study, we analysed a natural rock sample at 2 μm spatial resolution at an ablation rate of 500 Hz. The ablation cell of the employed system (TV3, ESL, USA) provides ultra-fast wash-out and low dispersion of the sample aerosol, resulting in full signal wash-out between individual laser shots, and thus, no signal carry-over between pixels. In the presented experiment, data acquisition rates exceeding 1 million pixels per hour (1 Mpx/hr) were achieved. Ultra-fast wash-out of the ablation cell in combination with the data acquisition rates of the ICP-TOFMS allow for full-elemental information on every pixel, without compromises in data quality or sensitivity.

We present examples of applying clustering and segmentation algorithms to the resulting highly multiplexed data set for the purpose of highly specific data processing.