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Commentary

The pioneering works devoted to the connection of laser ablation to ICP date back to the 80s of the 20th century. The first connection of laser sampling with ICP was carried out with optical detection (ICP-OES). The published results were very promising with both the absolute limit of detection and the precision comparable to solution analysis. When the connection of laser sampling with ICP-MS was first published several problems were found; an inappropriate ICP-MS construction for linking with laser ablation (LA) and the amount of ablated material was so high that it caused its deposition in a sampler cone. On the other hand, the limit of detection lower than 1 mg/kg demonstrated the potential of this technique in the future. At that time, ruby lasers were used for ablation, creating large craters with a diameter of hundreds of μm and producing a huge amount of ablated material (200 μg/pulse). The LA-ICP was introduced as a possible quantitative method for analysis of solid samples without dissolution. As the development of lasers continued, ablation craters became smaller and detection limits at OES became inadequate. Hence, ICPs with mass detection were able to respond to a decreasing amount of ablated material. As the information about total content of elements in the sample may be insufficient for some applications, lateral distribution of elements in the sample is of interest. Therefore, since the beginning of the 21st century, the investigation of the spatial distribution of elements in all possible types of samples has been the focus of LA-ICP-MS.

This work aims to show my contribution to the study of elemental distribution by LA-ICP-MS in various types of materials from metallic samples through geological to biological. The ability of laser ablation with mass spectrometry of inductively coupled plasma (LA-ICP-MS) for elemental distribution is shown on metallic, geological, and biological materials. In the first part, the development of LA-ICP-MS for identification and description of corrosion processes on Ni-based alloys caused by LiF-NaF mixture is described. For geology, the evolution of the lateral distribution is monitored from the single spot analysis in specific zones in individual grains to the imaging of entire grains. The final part is focused on the distribution in biological tissues. As the distribution of elements by LA-ICP-MS has become a routine analysis, our efforts have forwarded to the imaging of specific biomolecules. For these purposes, we developed two ways for molecular imaging – labelling of antibodies by Au nanoparticles and utilisation of molecularly imprinted polymers (MIPs).

I have chosen 16 research articles related to elemental distribution as a part of my thesis. My contribution to these articles is summarised in the following tables with special attention to the experimental work, supervision of students, manuscript preparation and research direction.

1) Novotny, K.; Vaculovic, T.; Galiova, M.; Otruba, V.; Kanicky, V.; Kaiser, J.; Liska, M.; Samek, O.; Malina, R.; Palenikova, K. Applied Surface Science 2007, 253, 3834-3842 (IF=5.155)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
20	30	20	10

2) Vaculovic, T.; Sulovsky, P.; Machat, J.; Otruba, V.; Matal, O.; Simo, T.; Latkoczy, C.; Gunther, D.; Kanicky, V. Journal of Analytical Atomic Spectrometry 2009, 24, 649-654 (IF=3.646)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
20	-	80	-

3) Vaculovic, T.; Warchilova, T.; Simo, T.; Matal, O.; Otruba, V.; Mikuska, P.; Kanicky, V. Journal of Analytical Atomic Spectrometry 2012, 27, 1321-1326 (IF=3.646)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
30	50	70	30

4) Warchilova, T.; Dillingerova, V.; Skoda, R.; Simo, T.; Matal, O.; Vaculovic, T.; Kanicky, V. Spectrochimica Acta Part B-Atomic Spectroscopy 2018, 148, 113-117 (IF=3.101)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
10	100	30	80

5) Novak, M.; Gadas, P.; Filip, J.; Vaculovic, T.; Prikryl, J.; Fojt, B. Mineralogy and Petrology 2011, 102, 3-14 (IF=1.573)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
30	-	20	-

6) Bacik, P.; Uher, P.; Ertl, A.; Jonsson, E.; Nysten, P.; Kanicky, V.; Vaculovic, T. Canadian Mineralogist 2012, 50, 825-841 (IF=1.398)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
30	-	20	-

7) Breiter, K.; Gardenova, N.; Vaculovic, T.; Kanicky, V. Mineralogical Magazine 2013, 77, 403-417 (IF=2.21)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
30	50	20	30

8) Vaculovic, T.; Breiter, K.; Korbelova, Z.; Venclova, N.; Tomkova, K.; Jonasova, S.; Kanicky, V. Microchemical Journal 2017, 133, 200-207 (IF=3.206)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
60	-	90	90

9) Petrík, I.; Janák, M.; Klonowska, I.; Majka, J.; Froitzheim, N.; Yoshida, K.; Sasinková, V.; Konečný, P.; Vaculovič, T. Journal of Petrology 2020 (IF=3.38)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
30	-	20	10

10) Vaculovic, T.; Warchilova, T.; Cadkova, Z.; Szakova, J.; Tlustos, P.; Otruba, V.; Kanicky, V. Applied Surface Science 2015, 351, 296-302 (IF=5.155)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
20	60	80	40

11) Anyz, J.; Vyslouzilova, L.; Vaculovic, T.; Tvrdonova, M.; Kanicky, V.; Haase, H.; Horak, V.; Stepankova, O.; Heger, Z.; Adam, V. Scientific Reports 2017, 7 (IF=4.011)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
15	40	30	30

12) Tvrdonova, M.; Vlcnovska, M.; Vanickova, L. P.; Kanicky, V.; Adam, V.; Ascher, L.; Jakubowski, N.; Vaculovicova, M.; Vaculovic, T. Analytical and Bioanalytical Chemistry 2019, 411, 559-564 (IF=3.286)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
10	30	50	50

13) Munster, L.; Fojtu, M.; Capakova, Z.; Vaculovic, T.; Tvrdonova, M.; Kuritka, I.; Masarik, M.; Vicha, J. Biomacromolecules 2019, 20, 1623-1634 (IF=5.667)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
20	40	20	15

14) Vaneckova, T.; Vanickova, L.; Tvrdonova, M.; Pomorski, A.; Krezel, A.; Vaculovic, T.; Kanicky, V.; Vaculovicova, M.; Adam, V. Talanta 2019, 198, 224-229 (IF=4.916)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
20	40	25	30

15) Vaneckova, T.; Bezdekova, J.; Tvrdonova, M.; Vlcnovska, M.; Novotna, V.; Neuman, J.; Stossova, A.; Kanicky, V.; Adam, V.; Vaculovicova, M.; Vaculovic, T. Scientific Reports 2019, 9 (IF=4.011)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
15	40	15	30

16) Dumkova, J.; Smutna, T.; Vrlikova, L.; Kotasova, H.; Docekal, B.; Capka, L.; Tvrdonova, M.; Jakesova, V.; Pelkova, V.; Krumal, K.; Coufalik, P.; Mikuska, P.; Vecera, Z.; Vaculovic, T.; Husakova, Z.; Kanicky, V.; Hampl, A.; Buchtova, M. ACS nano 2020, 14, 3096-3120. (IF=13.903)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
10	25	10	25