Dr. Stepan Chernonozhkin

Employment

2018-2021	EoS postdoctoral researcher, Department of Chemistry, A&MS research group, University Ghent, Belgium
2017-2018	CREGU Postdoctoral researcher, Laboratoire GeoRessources – Université de Lorraine, and CRPG Nancy, France
2012-2016	Joint PhD, University Ghent and Vrije Universiteit Brussel, Belgium. Frank Vanhaecke and Philippe Claeys amet
2010-2012	ICP-MS technician, Analytical Centre of Sobolev Institute of Geology and Mineralogy, Novosibirsk, Russia
2005-2010	Specialist degree, Chair of Analytical Chemistry, Novosibirsk University, Russia

About me

I am an analytical chemist and geochemist working at the Montanuniversität Leoben, Austria, where I develop novel trace element and stable isotope proxies and apply them to answer geo- and cosmochemical problems. Since the end of my PhD on isotope fractionation of Ni and Fe during asteroid differentiation in 2016, my field of interest includes development of novel (LA-)MC-ICP-MS protocols and to study isotope fractionation mechanisms of non-traditional stable isotopes in the Solar System due to evaporation, diffusion, equilibration between minerals, stable isotope thermomenters, etc.

How did high temperature processes in the Solar System affect stable isotope ratios and which elements we should use as proxies to understand the evolution of early planetesimals to terrestrial planets? How can cutting-edge developments in high precision mass spectrometry contribute to the geo- and cosmochemistry field? Can the application of new high-resistance amplifiers in MC-ICP-MS and TIMS lead to the development of new proxies in geochemistry and/or raise already traditional tools to the next level? How can these amplifiers contribute to LA-MC-ICP-MS? When should internal normalization of the mass bias be used in MC-ICP-MS and when should we rely on cumbersome double spike protocols? Where is the limit of the in situ stable isotope proxies and when can solution MC-ICP-MS of ultra-small element quantities be applied instead? Is femtosecond laser ablation the universal tool for in situ MC-ICP-MS in geo applications and where do nanosecond lasers suffice?

Working at the edge of modern analytical chemistry, ICP mass-spectrometry and isotope geo- and cosmochemistry, I’m trying to address these questions. The core interests of my research is the development of the plasma source mass spectrometry analytical methods, including in situ measurements via laser ablation at the mineral scale and geo- and cosmochemistry of non-traditional stable isotopes. My PhD in the A&MS group in University Ghent has provided me with a broad range of practical skills in state of the art (MC)-ICP-MS applications and in associated techniques. At the same time, I have acquired knowledge in geo- and cosmochemistry through collaborations with the Analytical, Environmental and Geo- Chemistry research unit of the VUB, Brussels (Belgium) and the CRPG Nancy and Laboratoire GeoRessources, Université Lorraine (France). Through these collaborations, I studied the early core formation processes using Ni, Fe stable isotopes in pallasites and iron meteorites, diffusive Fe, Ni isotope profiles, and 2D trace element distributions. Together with my colleagues from KU Leuven, I developed methods for LA-MC-ICP-MS analysis of Sr, Pb in glass for archeometry applications. During my postdoc stay at the CRPG Nancy and Laboratoire GeoRessources, Université Lorraine, France, I broadened my scientific views with additional analytical techniques, such as TIMS, SEM, and isotope dilution applications, as well as application of Re-Os and Sm-Nd isotope decay couple chronometers and the geochemistry of ore deposits. I demonstrated that rammelsbergite (NiAs2 mineral) is suitable for use as a valuable Re-Os age proxy, equivalent to the now routinely measured molybdenite. As a postdoc in the highly interdisciplinary ET-HOME EoS project in Belgium, I applied my expertise in stable isotope analysis (Fe, Cu, Zn, Mg) to understand ureilite and primitive meteorite evolution, which has a direct bearing on our understanding of how the terrestrial planets formed in the early Solar System.

I used isotopic composition of microtektites, measured at high precision via LA-MC-ICP-MS, as an isolated case of evaporative isotope fractionation of moderately volatile elements on Earth to understand how hypervelocity impacts affected the isotope budgets of asteroids and planetary bodies in the Solar System. The outcomes of my research have been published in a wide variety of top-tier journals and presented at international conferences, with topics covering both analytical chemistry and geo/cosmochemistry.