Abstract

This dissertation consists of three scientific articles, two of which have already been published, and the third is currently undergoing peer review. The complete texts of the publications are appended to this thesis.

This dissertation presents a discussion of the methodology used in the geochemical processing of mantle peridotites and the extraction of information from a limited sample size. In the course of this dissertation, I have acquired proficiency in the methodologies of peridotite sample preparation, acid digestion of the sample, separation of radiogenic Sr–Nd–Pb–Os–Hf isotopes, leaching and determination of total sulfur content in peridotites, separation and determination of siderophile elements, and in-situ determination of elements by laser ablation and electron microprobe. The methodology of sample preparation, separation and measurement of Sr-Nd-Pb isotopes was optimised in the conditions of CGS laboratories. The methodologies were validated by measuring a large number of international isotope standards, and the results were published. This publication forms part of my PhD thesis.

The second part of the dissertation addresses the heterogeneity of the Earth's mantle under the Bohemian Massif. Specific focus was placed on Re–Os isotopes and PGE composition. A total of 14 sites distributed across the Bohemian Massif were selected for the research project. A total of 49 xenoliths were selected for isotopic analysis. A subset of the results from 11 sites was published in Kochergin et al. (2016). The remaining results will be published in the paper by Erban Kochergina et al., which is currently under review.

It was not the intention of this dissertation to resolve all issues of SCLM heterogeneity beneath the Bohemian Massif. However, one of the aims was to contribute to the ongoing discussion on the different types of metasomatism that have influenced its composition. The application of Re-Os isotope analysis and PGE distribution enabled the proposal of subduction in the western

part of the Ohře rift as a factor influencing the composition of the lithospheric mantle to be supported.

The contribution of this work was the calculation of Re–Os model ages for peridotite xenoliths from localities across the Ohře rift. The calculated mantle extraction ages (T_{MA}) range from 0.1 to 2.1 Ga, with several cases of unrealistic "future" ages explained by the presence of metasomatic overprinting. The Re (T_{RD}) compartment ages exhibit a range from 0.1 to 1.6 Ga. However, T_{RD} cannot be directly compared to crustal ages because they represent a minimum age rather than a specific age estimate, also in part due to consideration of total Re removal from the rocks. Accordingly, a modified model age (T_{RDII}) was calculated assuming a non-zero Re content in the pre-metasomatic phase and using a composition representative of the most depleted sample in the suite. The pronounced peak in the calculated T_{RDII} age is between 0.5 and 0.6 Ga, corresponding to the Cadomian orogenic cycle.