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| 学位論文の要旨                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                   |
| Abstract of Thesis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                   |
| 研究科<br>School                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Graduate School of Natural Science and Technology |
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| 学位論文題目 Title of Thesis（学位論文題目が英語の場合は和訳を付記）                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                   |
| Characteristics of <i>UHP</i> garnet peridotite in the Moldanubian Zone of the Bohemian Massif (Nové Dvory, Czech Republic)<br>ボヘミア山塊のモルダヌビア帯（チェコ共和国ノブドボリー）の超高压柎榴石かんらん岩の特徴                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                   |
| 学位論文の要旨 Abstract of Thesis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                   |
| <p>Plate tectonic processes, migration and collision of rigid tectonic plates, driven by mantle convection, have constantly promoted intense formation and reworking of the continental and oceanic crusts. Orogenic belts, forming along convergent plate boundaries, are the loci of interactions between tectonic, magmatic and metamorphic processes and they create unique natural laboratories for Earth scientists. The discovery of coesite in rocks spawned the study of ultrahigh pressure (<i>UHP</i>) metamorphic rocks. Prior to this discovery, coesite was “restricted” to the Earth’s mantle (and kimberlite xenoliths) or were otherwise considered to be a by-product of meteoritic impact. Over the years, extensive research on <i>UHP</i> metamorphism have led to new discoveries of coesite and other ultrahigh pressure phases (e.g., diamond) within <i>HP/UHP</i> metamorphic rocks occurring within different collisional orogenic belts in various parts of the world. Research in <i>UHP</i> metamorphism plays an important role in extending our understanding of the large-scale Earth processes, such as continental collisions, deep subduction and exhumation, mountain building, geochemical recycling during subduction etc.</p> <p>This study treated ultra-high pressure (<i>UHP</i>) rocks, specifically garnet peridotite rocks (referred to as Nové Dvory garnet peridotite) collected from a <i>UHP</i> locality in the Moldanubian Zone of the Bohemian Massif situated in Czech Republic. The locality reportedly experienced ultrahigh pressure (&gt; 4 GPa) and high temperature (&gt; 1000 °C) conditions. Under such conditions, geologic processes are difficult to identify due to intense reactions and deformation activities which may erase early and primary history of the rocks. In fact, previous reports on Nové Dvory garnet peridotites indicate that prograde metamorphism evidence is uncommon.</p> <p>The aim of this study was to identify the geochemical characteristics of the garnet peridotite rocks and constrain their pressure-temperature (<i>P-T</i>) histories for better understanding the origin and evolution of the rocks. Detailed petrological and chemical analyses were performed on the garnet peridotites samples and <i>P-T</i> conditions were calculated using thermobarometric and thermodynamic modelling techniques.</p> <p>This study revealed the presence of Al- and Cr-rich spinels, clinopyroxenes with less contents of Na and Fe than previously reported and chemical heterogeneity in garnet in the studied samples. Cr-poor (0.06–0.12 a.p.f.u.) and Cr-rich (0.10–0.27 a.p.f.u.) garnet populations were identified and they had contrasting coronas around garnet. The garnet peridotites samples were classified into three types, on the basis of the chemical compositions of garnet and constituent minerals: type A that includes Cr-rich spinel and Cr-rich garnet; type B that includes Cr-poor garnet and no spinel; and type C that includes both Al- and Cr-rich spinel and both Cr-rich and Cr-poor garnet. The finding</p> |                                                   |

of spinel relics  $\{Cr\# = [100 Cr/(Cr + Al)] \sim 60-70\}$  in garnet from the type A peridotite suggests that the Nové Dvory peridotite body might have been located at relatively shallow depths prior to ultrahigh-pressure metamorphic stage of  $> 4$  GPa.

To establish the  $P$ - $T$  evolution of the studied peridotites, suitable thermobarometers were utilized for different compositional pairs of garnet and pyroxenes. The  $P$ - $T$  evolution was divided into two stages: Stage I and Stage II in the order of occurrence from early to late stages, respectively. Stage I yielded lower  $P$ - $T$  conditions compared to Stage II for all the samples studied. Subsequently, phase relations for the different bulk compositions were also calculated using the Perple\_X (version 6.8.8) set of computer programs which is based on free-energy minimization techniques

On the basis of the mineral data and  $P$ - $T$  estimates obtained, it is concluded that the Nové Dvory peridotite body has existed as medium  $P$ / $T$  spinel peridotite and then experienced prograde metamorphism equilibrating at higher  $P$ - $T$  conditions followed by the transformation into garnet peridotite after which it was exhumed with significant cooling to crustal levels. The findings from this study also showed chemical heterogeneity (especially in Cr contents of garnet) within one sample of type C peridotites (especially in Cr contents of garnet) may have been created by mechanical mixing of different rock types (i.e., Cr-rich and Cr-poor types) without chemical homogenization, or partial metasomatic event (e.g., infiltration of melt) during the compression and/or decompression stage(s). The general impression is that the Nové Dvory garnet peridotite body has experienced a complex  $P$ - $T$  evolution history and each type has its own unique petrogenic history. Subsequently, they were juxtaposed during exhumation.