



University of Genova

Department of Earth, Environmental
and Life Sciences

Doctorate Course in Earth and
Environmental Science and
Technology

Earth Science Curriculum



Research Theme n 1

Titolo Proprietà fisiche e termodinamiche dei minerali all'interno dei pianeti
Title Physical and thermodynamic properties of minerals in planetary interiors
Tutor Donato Belmonte – DISTAV, University of Genova (Italy)
Co-tutor Daniele Antonangeli – IMPMC, Sorbonne Université, Paris (France)
Program description including the formation program abroad Physical and thermodynamic properties of silicate and oxide minerals are crucial to understand the dynamics and chemical evolution of telluric planets like Mars, Mercury, Venus and the Earth. The main goal of this research is to gain original insights on the structure, composition and phase stability relations of minerals in deep planetary interiors by merging multi-scale computational modelling and laboratory experiments at high pressure and temperature conditions (HP-HT). A 3- to 6-month mobility period abroad at the Institut de Minéralogie, de Physique de Matériaux et de Cosmochimie (IMPMC, Sorbonne Université, Paris) is planned to perform different kinds of high-pressure experiments (i.e. laser-heated diamond anvil cell and multi-anvil cell experiments, Brillouin scattering, XRD, etc.).
Financial support: The research program is supported by PRIN and INGV projects funded to Donato Belmonte by MUR (PRIN Projects: 2017KY5ZX8 and 202037YPCZ; Project INGV Pianeta Dinamico 2023-2026 – EMOTION, CUP N. D53J19000170001)
Tutor's publications of the last 3 years Selected tutor's publications <u>about the research theme</u> (last 3 years): Belmonte, D. , La Fortezza, M., and Menescardi, F. (2022) Ab initio thermal expansion and thermoelastic properties of ringwoodite (γ -Mg ₂ SiO ₄) at mantle transition zone conditions. <i>European Journal of Mineralogy</i> , 34, 167-182. Nestola, F., Prencipe, M., and Belmonte, D. (2023) Mg ₃ Al ₂ Si ₃ O ₁₂ jeffbenite inclusion in super-deep diamonds is thermodynamically stable at very shallow Earth's depths. <i>Scientific Reports</i> , 13, 83. Ardit, M., Conte, S., Belmonte, D. , Menescardi, F., Pollastri, S., Cruciani, G., and Dondi, M. (2023) Structure evolution of Ge-doped CaTiO ₃ (CTG) at high pressure: search for the first 2:4 locked-tilt

perovskite by synchrotron X-ray diffraction and DFT calculations. *Inorganic Chemistry*, 62, 16943-16953.

Menescardi, F., Ceresoli, D. and **Belmonte, D.*** (2024) Melting behavior of CaO at high temperature and pressure: a molecular dynamics study. *Journal of Physical Chemistry C*, 128, 18498-18508.
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