

Mattia La Fortezza

Curriculum vitae

Date of birth:

Nationality:

Work contact:

Personal contacts

Languages:

RESEARCH INTEREST

- Ab initio thermodynamics and geochemistry of solids and melts
- Computational mineral physics, lattice dynamics, thermodynamics and thermochemistry of minerals at high pressure and temperature conditions
- Computational thermodynamics applied to phase diagrams calculations for the Earth's deep interior
- Subsolidus and melting relations of minerals at deep Earth's conditions

SCIENTIFIC EXPERTISE

Ab initio DFT calculations and modelling of thermodynamic and chemico-physical properties of crystalline solids and melts with application to phase equilibria simulation

- Performing ab initio calculations on the CRYSTAL quantum-mechanical code: writing and interpretation of input/output files, running parallel calculations on HPC resources (computer clusters and supercomputers)
- Calculation of thermodynamic and thermoelastic properties of solid phases using in-house FORTRAN codes and scripts
- Calculation of phase diagrams in multi-component systems with self-produced, commercial or freeware softwares based on Gibbs free energy minimization algorithms (e.g. PERPLE_X).
- Calculation of seismic and elastic properties of crystalline solids with commercial or freeware computer programs (e.g. CAREware package).
- Compilation and analysis of thermodynamic databases

Techniques

- **Diffraction:** Single crystal diffractometer. Basic experience in conceiving, planning and executing experiments, measurements and data analysis. Basic knowledge of data analysis with the CRYSTALIS software. Such skills were acquired during the bachelor thesis work, analysing crystallographic relations between daughter phases in fluid inclusions and olivine host in metamorphic rocks.
- **Spectroscopy:** Raman spectrometer. Basic knowledge in conceiving, planning and executing experiments, measurements and data analysis and interpretation. Such skills were acquired during the master thesis work, characterizing and identifying daughter phases in fluid inclusions hosted in metamorphic rocks.
- **High pressure experimental procedures:** diamond anvil cells (membrane-driven Le Toullec design). Basic knowledge of diamonds alignment, gasket preparation (Ruby fluorescence systems) and sample loading for room temperature experiments. Such skills were acquired during a three months internship at the Institut de Minéralogie, de Physique des Matériaux et de Cosmochimie (IMPMC, Sorbonne Université) under the supervision of dott. Daniele Antonangeli.
- **Softwares:** Windows operating system, Office package and Adobe for daily use. Knowledge of OriginPro for advanced and basic data analysis. Knowledge of specific software for data and image treatment such as: ImageJ, EoSfit, OrientXplot, Moldraw, Epicalc. Basic knowledge of Python language applied to Matplotlib for plots realization.

EDUCATION

2024: **Ph.D. in Earth Sciences.** (University of Genova)

- Thesis: Thesis: Probing the role of MgSiO₃ polymorphs in mantle processes.
- Academic tutor: Prof. Donato Belmonte (University of Genova).

2020: **Master of Science** (University of Milano Bicocca, Italy)

- M.Sc. Thesis: Epitaxial mineral growth in olivine-hosted multiphase inclusions of subducted metamorphic harzburgites as monitor of fluid-mediated redox equilibria in the mantle. Mark: 110/110 with honours. Supervisors: Prof. Nadia Malaspina (University of Milano Bicocca), Prof. Marcello Campione (University of Milano Bicocca), Prof. Simone Tumiati (University of Milan).

2018: **Bachelor of Science** (University of Milano Bicocca, Italy)

- B.Sc. Thesis: Multiphase inclusions in harzburgites from the Bétic Cordillera (Cerro de Almirez, Spain) growth and orientation of magnetite in olivine. Mark: 110/110 with honours. Supervisors: Prof. Nadia Malaspina (University of Milano Bicocca), Prof. Marcello Campione (University of Milano Bicocca), Prof. Matteo Alvaro (University of Pavia).

PROFESSIONAL EXPERIENCE

2024 – present

PostDoc researcher at the Department of Earth, Environment and Life Sciences (DISTAV) of the University of Genova (Genova, Italy), in the framework of the MUR-PRIN 2020 project (Prot. 202037YPCZ – Title: “Dynamics and timescales of volcanic plumbing systems : a multidisciplinary approach to a multifaceted problem”).

- Research field: Ab initio computational thermodynamics of melting processes, phase diagram and phase relations of CaSiO₃ mineral phases at Earth’s mantle conditions.

2022 – 2023 (3 months: 15 nov 2022 – 15 dec 2022; 1 mar 2023 – 30 apr 2023)

- **Research internship** at the Institut de Minéralogie, de Physique des Matériaux et de Cosmochimie (IMPMC, Sorbonne université, Paris, France). Investigation of almandinic garnet elastic properties via X-ray diffraction experiments combined with acoustic picosecond measurements. The internship lasted three months (15 nov 2022 – 15 dec 2022; 1 mar 2023 – 30 apr 2023). Supervisor: dott. Daniele Antonangeli.

2019 – 2020

Tutoring activity (type A tutor) (Geological Sciences and Technologies, University of Milano Bicocca, Italy)

- Support and help for the enrolled students orientation under the supervision of Prof. Marcello Campione.

2019 – 2020

Tutoring activity (type C tutor) (Geological Sciences and Technologies, University of Milano Bicocca, Italy)

- Tutoring activity in support of the course “Principles of Geology - Introduction to Petrography” under the supervision of Prof. Nadia Malaspina. Support for the students during the preparation of the exam “Introduction to Petrography”.

16/09/2019– 19/09/2019

Student helper at the National Congress “Parma 2019, Il tempo del pianeta Terra e il tempo dell’uomo, le geoscienze tra passato e futuro”

2019 **Curricular internship** for the course of Principles of Geology, Introduction to Petrography (Geological Sciences and Technologies, University of Milano Bicocca, Italy).

- Preparation and description of rock samples for the laboratory of Introduction to Petrography under the supervision of Prof. Nadia Malaspina.

SCIENTIFIC AWARDS

10 november 2023 – Accademia dei Lincei (Italy): “Premio Giuseppe Schiavinato” 2023, Master thesis prize intended for thesis on Mineralogical Sciences, with emphasis on petrologic applications (5000 €)

CONFERENCES PARTICIPATION AND SUBMITTED ABSTRACTS

SIMP-SGI-SoGei-AIV joint congress: the Geosciences paradigm: resources, risks and future perspective (Potenza, Italy) 19-21/09/2023. Oral presentation: *Stability and metastability of MgSiO₃ pyroxenes at deep mantle conditions: new insights from ab initio calculations.*

EGU General Assembly 2023 (Vienna, Austria) 23-28/04/2023. Poster: *Ab initio thermodynamics and phase stability of MgSiO₃ pyroxene polymorphs: new insights on protoenstatite*

SGI-SIMP joint congress: Geosciences for a sustainable future (Torino, Italy) 19-21/09/2022. Oral presentation: *Ab initio thermodynamics of MgSiO₃ protoenstatite at high temperatures and implications for planetary processes.*

4th joint AIC-SILS conference (Trieste, Italy) 12-15/09/2022. Oral presentation: *Ab initio thermodynamics of MgSiO₃ protoenstatite at high temperatures conditions.*

1st Congress of Società Geochimica Italiana “From theoretical to applied geochemistry” (Genova, Italy) 5-8/07/2022. Oral presentation: *Towards an ab initio physically-consistent thermodynamic dataset for deep mantle phases: the case of Mg₂SiO₄ ringwoodite*

BeGeo scientists 2021 – I Congresso Nazionale dei Giovani Geoscientziati (Napoli, Italy) 7-10/10/2021. Poster: *Ab initio thermodynamics of minerals at deep Earth's conditions: the case of ringwoodite*

90th congress of Italian Geological Society (SGI) (virtual edition) (Trieste, Italy) 14-16/09/2021. Online poster: *Towards an ab initio physically-consistent thermodynamic database for deep mantle phases: the case of Mg₂SiO₄ ringwoodite*

GCI @home event: the first online event of the Italian young crystallographers 28-30/09/2020. Online poster: *Epiaxial match drives the growth of magnetite microinclusions in olivine in rocks recording desertinization under mantle conditions*

SIMP-SGI-SoGei joint congress: il tempo del pianeta Terra e il tempo dell'uomo: le geoscienze tra passato e futuro (Parma, Italy) 16-19/09/2019. Poster: *Multiphase inclusions in harzburgites from the Bétic Cordillera (Cerro de Almirez, Spain): growth and orientation of magnetite in olivine*

PUBLICATIONS ON PEER-REVIEWED JOURNALS

Malaspina, N., Campione, M., Tumiati, S., Murri, M., Fumagalli, P., Cerantola, V., **La Fortezza, M.**, Scambelluri, M. (2023). Epitactic magnetite growth in fluid inclusions as driving force for olivine oxidation coupled with hydrogen production at high pressure. *Chemical Geology*, 629, 121495.

Belmonte, D., **La Fortezza, M.**, & Menescardi, F. (2022). Ab initio thermal expansion and thermoelastic properties of ringwoodite (γ -Mg₂SiO₄) at mantle transition zone conditions. *European Journal of Mineralogy*, 34(2), 167-182.

Campione, M., **La Fortezza, M.**, Alvaro, M., Scambelluri, M., & Malaspina, N. (2020). Commensurate growth of magnetite microinclusions in olivine under mantle conditions. *ACS Earth and Space Chemistry*, 4(6), 825-830.

GENOVA

I authorize the processing of personal data in conformity at d.lgs n. 196/2003.

01/07/2024

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