

Francesco Radica

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RESEARCH AND EDUCATION

2015 PhD degree, Università degli Studi di Roma Tre

PhD obtained 20/March/2015, defending the Thesis: A crystal-chemical study of cordierite, synthesis and stability at variable H₂O and CO₂ concentration: geological and technological applications

Through a multidisciplinary approach, made possible thanks to the numerous national and international collaborations, the project integrates experimental mineralogy, with the most advanced techniques in Fourier Transform Infrared (FTIR) spectroscopy like 2D imaging, HT in-situ analysis and High Resolution Synchrotron mapping. I evaluated the solubility and the diffusion rates of CO₂ and H₂O inside micro-porous minerals like cordierite and beryl (emeralds). I put particular emphasis on the ability of these minerals to stock permanently CO₂.

Supervisor: Prof. Giancarlo Della Ventura (Roma Tre),

Collaborations: G. Cinque (Diamond Light Source, UK), H. Beherens (Leibniz University, Germany), M. D. Gunter (University of Idaho), J. Ingrin (University of Lille 1), C. A. Marcelli, (INFN-LNF, Frascati, Italy), C. Freda, S. Mollo (INGV, Rome, Italy), F. Bellatreccia (Roma Tre).

2010 Master degree, Università Studi Roma Tre(110/110 cum laude)

Relevant modules:

- Advanced optical mineralogy and gemology
- Analytical and Experimental techniques
- GIS (editing and spatial analysis)
- Structural and Field Geology

Thesis: Micro-analysis and distribution of volatile components (H and C) in cordierite: implication in petrology – Multi methodological study of a wide range of cordierite minerals. The methods included: FTIR spectroscopy and imaging, Single Crystal (SC) XRD, SEM, EMPA, SIMS, Raman and advanced SC optical characterization.

2006 Bachelor degree, Università G. D'Annunzio Studi Roma Tre(110/110 cum laude)

Thesis: The evaluation of acoustic wave velocity in mantle minerals using a Multi-anvil device - A theoretical study concerning the evaluation of physical and elastic properties of mantle minerals using *in-situ* high pressure and high temperature techniques.

RELEVANT COURSES ATTENDED

Multivariate IR Micro-spectroscopy Analysis Training Course (Diamond Light Source, UK)

Advanced Methods in Optical Mineralogy M. Gunter (University of Idaho)

Crystallography Beyond Diffraction: the role of spectroscopies and theoretical calculations in revealing structural information (AIC International School, University of Camerino)

Layered minerals structures and their applications in advanced technologies (A Mottana, R Oberti, Accademia dei Lincei, Roma)

AWARDS

Premio "Giuseppe Schiavinato", Accademia Nazionale dei Lincei, June 2011. Award for best Master Thesis in mineralogy with petrological implications

Premio SIMP PhD Award 2015, Società Italiana Mineralogia e Petrografia, September 2015. Award for best PhD Thesis in mineralogy and petrography.

PROFESSIONAL SKILLS

Field work: I have gained basic field work experience during the university period.

Laboratory Skills: During my research activities I cooperated with physicists, chemists, biologists, and engineers and I have an extensive experience in Fourier Transform Infrared Spectroscopy in materials of both geological and technological relevance. I'm acquainted on the use 2D detectors, qualitative and quantitative phase determination and *in-situ* High Temperature-FTIR analysis. I have experience in the use of IR synchrotron sources. I have become proficient in the use of high temperature and high pressure experimental and synthesis apparatuses including piston-cylinders and autoclaves. I have expertise in optics, mineral optics and advanced analytical methods in optical mineralogy, including the use of the spindle stage for optical crystal-chemistry, refraction index measurements and crystal orientations for spectroscopy. I developed a very good attitude in laboratory teamwork and management. I am acquainted with the manipulation, preparation and orientation of micro samples.

Numeracy and analytical skills: I have knowledge in physics, chemistry and math numeracy and in the context of data processing and analytical thinking, especially 2D dataset processing or peak fitting. Furthermore, I become proficient in working with large multidisciplinary datasets. I'm acquainted to process and interpret data from different analytical instruments: EMPA, SEM-EDAX, X-ray diffraction, SIMS, microRaman.

Main research interests:

- Microporous materials and fluid diffusion; gas and liquid inclusions in mineralogical samples
- High temperature, high pressure phase changes and FTIR spectra evolution
- Polarized light FTIR analysis and imaging
- Material characterization using innovative techniques (TOF-SIMS, FIB, IR-SNOM, nano-indentation)
- Advanced methods in optics and microscopy
- Data analysis and image processing (Peak fitting, Multivariate IR analysis, image enhancing and filtering)

TRANSFERRABLE SKILLS

Communication and presentation skills: I have undertaken numerous projects that have involved both independent and team work. I presented my latest research results in departmental talks and at several international meetings. I'm interested to travel abroad to attend courses, meetings or workshops. During my PhD experience I performed student tutoring in optical mineralogy and FTIR micro-spectroscopy.

Computer and technical literacy: Excellent knowledge of Windows and different software for word processing, graphic and data processing work, such as: Word, PowerPoint, Excel, CorelDraw, SigmaPlot, OriginPro, Matlab, Bruker Opus.

Languages: Italian is my first language. Very good knowledge of English language (used in writing scientific reports). I also understand basic French.

Driving licences: I hold a full European driving licence and an international driving.

OTHER WORK EXPERINECE

I participated to beamline sessions for FTIR spectroscopy research activities at:

Diamond light Source, B22, in December 2012, February 2014, June 2015 and September 2015.

Helmholtz-Zentrum Berlin BESSY II, IRIS, in June 2011

August 2013: Stuart for the 2013 Goldschmidt conference

Since 2011 Student tutoring in optical mineralogy at University of RomaTre

Since 2000 I occasionally work as a sales assistant in my family business

