Mathieu CHASSÉ

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Skills and Motivations

Curiosity, dynamism, rigour, efficiency, determination.
My current research focuses on the speciation of chemical elements in the environment. My career path provides me with a strong expertise in mineralogy and (bio)geochemistry, in particular in the synthesis and identification of mineral phases as well as in the techniques of characterisation at micro- and nano-scales to study the associated chemical species. I wish to work on projects on chemical elements mobility in supergene conditions, focusing on critical metals, in order to foster the diversification of these resources. Fundamentally, I aim at improving our understanding of the alteration processes at stake in the formation and evolution of Earth's critical zone.

Research Interests

Crystal chemistry of amorphous and crystalline phases.

Chemical elements dynamics and implications for critical mineral resources.

Mineral–organic associations and soil organic carbon dynamics.

Research and Teaching Experience

2019 – pres. **Assistant professor**, *Mineralogy*, Sorbonne University, Paris.

2018 – 2019 **Post-doctoral researcher**, *Processes of Multi-Decadal Stabilisation of Carbon in Soils by Organo-Mineral Complexes*, Laboratoire de Géologie, École normale supérieure, Paris.

2017 – 2018 **Assistant lecturer**, *Ab-Initio Modelling of Scandium X-Ray Absorption Spectra ; teaching: "**Geosciences**" and "**Geochemistry**" (first-, third- and fourth-year students)*, Sorbonne Université, Paris.

2014 – 2017 **Ph. D.**, *Geochemical and Crystal-Chemical Processes of Scandium Enrichment from the Mantle to Lateritic Contexts*, IMPMC, Paris and ARC Centre of Excellence CCFS, Sydney.

2014 – 2017 **Teaching fellow**, *tutorials and practicals for the courses "**Environment and Heritage**", "**Resources**" and **academic advisor** (first- and third-year students)*, Sorbonne Université, Paris.

2013 – 2014 **Research internship**, *Microspectrophotometric Determination of Iron Oxidation State in Melt Inclusions*, IMPMC, Paris.

2013 Feb. – Jun. **Research internship**, *Contrasted Iron Speciation in Obsidians and Tektites: a Spectroscopic Study*, IMPMC, Paris.

2012 Mar. – Aug. **Research internship**, *Oxidation State and Coordination of Metals in Mineral and Biological Systems*, School of Earth, Atmospheric and Environmental Sciences, University of Manchester.

2011 June **Research internship**, *Optical Absorption Spectroscopy of Iron in Obsidians: Contribution of High Temperature Measurements*, IMPMC, Paris.

Education

2017 **Cotutelle Ph. D. — Geosciences, Natural Resources and Environment**, *Sorbonne Université,* Paris and *Macquarie University,* Sydney.

2014 **ENS diploma — Geosciences**, *École normale supérieure (highly-selective institution)*, Paris.

2013 **Master degree — Materials and Nano-Objects Sciences**, *Sorbonne Université*, Paris, honours.

2011 **Licence degree — Earth Sciences**, *Sorbonne Université*, Paris, honours.

2008 – 2010 **Intensive university foundation course preparing for the competitive entrance examinations to the French *Grandes Écoles* (highly-selective institutions)**, Nantes (France).

2008 **Baccalauréat diploma (French high-school diploma)**, Nantes (France), first-class honours.

Awards

2015 **International Macquarie University Research Excellence Scholarship (iMQRES)**, attributed by Macquarie University to support an international Ph. D. work.

2014 **Allocation spécifique**, from the École normale supérieure for a 3 years Ph. D. work.

2013 **Oldfield Award**, given by the Society of Glass Technology to reward the master thesis entitled *Contrasted Iron Speciation in Obsidians and Tektites: a Spectroscopic Study*.

Publications

08 Mathian, M., **Chassé, M.**, Calas, G., Griffin, W. L., O'Reilly, S. Y. & Allard, T. (in prep., *Geology*) Kaolinite Dating Reveals Miocene Weathering Pulses in Southeast Australia.

07 **Chassé, M.**, Blanchard, M., Juhin, A. & Cabaret, D. (under review, *Geochem. Perspect. Lett.*) First-Principle Calculations Unravel the Mechanisms of Scandium Sequestration by Iron Oxides.

06 **Chassé, M.**, Griffin, W. L., O'Reilly, S. Y. & Calas, G. (2019) Australian Laterites Reveal Mechanisms of Scandium Dynamics in the Critical Zone. *Geochimica et Cosmochimica Acta*, **260**, 292–310.

05 **Chassé, M.**, Juhin, A. *et al.* (2018) Influence of Crystallographic Environment on Scandium K-Edge X-Ray Absorption Near-Edge Structure Spectra. *Physical Chemistry Chemical Physics*, **20**, 23903.

04 **Chassé, M.**, Griffin, W.L., Alard, O., O'Reilly, S.Y., & Calas, G. (2018) Insights into the Mantle Geochemistry of Scandium from a Meta-Analysis of Garnet Data. *Lithos*, **310**, 409–421.

03 Verger, L., Dargaud, O., **Chassé, M.**, Trcera, N. *et al.* (2017) Synthesis, Properties and Uses of Chromium-Based Pigments from the *Manufacture de Sèvres*. *Journal of Cultural Heritage*, **30**, 26–33.

02 **Chassé, M.**, Griffin, W.L., O'Reilly, S.Y., & Calas, G. (2017) Scandium Speciation in a World-Class Lateritic Deposit. *Geochemical Perspectives Letters*, **3**, 105–114.

01 **Chassé, M.**, Lelong, G., van Nijnatten, P. *et al.* (2015) Optical Absorption Microspectroscopy (μ-OAS) Based on Schwartzschild-Type Cassegrain Optics. *Applied Spectroscopy*, **69**:4, 457–463.

Book Chapters

02 Samson, I.M., & **Chassé, M.** (2016) Scandium. In *Encyclopedia of Geochemistry* pp. 1–5. Springer International Publishing, Cham, Switzerland.

01 Griffin, W.L., & **Chassé, M.** (2016) Nickel. In *Encyclopedia of Geochemistry* pp. 1–4. Springer International Publishing, Cham, Switzerland.

Selected Communications

2019 **Deciphering Molecular-Scale Mechanisms Governing Scandium Dynamics in the Critical Zone**, *Goldschmidt2019*, Barcelona, Spain.

2018 **Ab-Initio *Modelling of Scandium K-Edge X-Ray Absorption Near-Edge Structure Spectra***, 17^{th} *International Conference on X-Ray Absorption Fine Structure (XAFS)*, Kraków, Poland.

2017 **Reappraisal of MORB Redox State Using Both Iron and Sulfur Speciation**, *AGU Fall Meeting*, New Orleans, La., United States.

2017 **Scandium Speciation in a World-Class Lateritic Deposit**, *Goldschmidt2017*, Paris, France.

2016 **Insights into Mantle Geochemistry of Scandium from the Main Carrier Minerals**, *Goldschmidt2016*, Yokohama, Japan.

2014 **Evidence of Peculiar Iron Speciation in Natural Glasses by Variable Temperature Optical Absorption Spectroscopy**, *general meeting of the International Mineralogical Association 2014*, Gauteng, South Africa.

2014 **Microspectrophotometric Determination of Iron Oxidation State in Melt Inclusions**, *Goldschmidt2014*, Sacramento, Calif., United States.

2013 **Contrasted Iron Speciation in Obsidians and Tektites: A Spectroscopic Study**, *Goldschmidt2013*, Florence, Italy.

Scientific Skills

Implemented Techniques

Microspectrophotometry: implementation of a new and original experiment using a Cassegrain microscope adapted on a spectrophotometer with the possibility to add a microthermometric stage.

Techniques Used

Geochemistry	(Laser ablation)–inductively coupled plasma mass spectrometry, X-ray fluorescence spectrometry.
Chemistry	Wet chemical analyses, selective leaching, hydrothermal synthesis.
Mineralogy	X-ray diffraction, scanning electron microscopy (imaging, energy dispersive X-ray spectroscopy (EDXS)), electron microprobe, transmission electron microscopy (imaging, electron diffraction, EDXS).
Spectroscopy	Optical absorption spectroscopy on solid phases (transmission and diffuse reflectance), X-ray absorption spectroscopy, electron energy loss spectroscopy.
Synchrotron Techniques	Measurements made at ESRF (Grenoble, France), SOLEIL (Paris, France), CLS (Saskatoon, Canada) and APS (Chicago, United States): XANES, EXAFS, XMCD, XRF mapping (trace elements analysis), STXM (nanoscale mapping and chemical analysis).
Calculations	First-principle calculations based on density functional theory (Quantum Espresso suite of codes), ligand-field multiplet calculations (Quanty suite of codes).

Computer Skills

Programming/ Softwares	Unix/Shell scripting, Python, R, HTML, LaTeX, Zotero.

Languages

French	native.
English	fluent, TOEFL (iBT) score: 108/120.
Spanish	good command.

Personal

Sports	climbing (bouldering and lead), short- and long-distance trail running (20 to 45 km).
Music	piano.
Other	hiking, cycling, scuba diving, reading.