Yishen (Eason) ZHANG

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PERSONAL INFORMATION

Date of Birth: 17th December 1993
Nationality: China
Institution: Department of Earth, Environmental and Planetary Sciences, Rice University
Address: 6100 Main Street, MS-126 Houston, TX 77005

GENERAL RESEARCH INTERESTS

My research interests focus on three aspects in igneous petrology:

1. Mantle melting and mantle heterogeneity in igneous provinces and ocean islands. I am interested in characterization of heterogenous mantle sources from major and trace elements, the degree of mantle melting accounts for the crustal thickness, trace element abundances in primary minerals
2. Crystallization kinetics, magma dynamics in magmatic systems. I am interested in understanding crystal size, texture, morphology and their responses to the change of magmatic conditions; Elemental diffusion and its application in addressing timescales in volcanic systems. Elemental partitioning under kinetic conditions.
3. Planetary interior structure, evolution and interior-atmosphere interactions. I am interested in using HTHP phase equilibria experiments to understand magma ocean and core/mantle differentiation of rocky planets.

To carry out my research, I use experiments combing with numerical modelling, thermodynamics, statistics, textural and geochemical analyzes

EDUCATION & ACADEMIC APPOINTMENTS

Rice University **03. 2024 – present**
CLEVER Planet postdoc associate *Houston, TX*

KU Leuven **06. 2019 – 02. 2024**
PhD in Geology *Leuven, Belgium*

University of Liège **10. 2018 – 04. 2019**
Visiting scholar *Liège, Belgium*

China University of Geosciences (Beijing) **09. 2016 – 05. 2019**
Master in Geology *Beijing, China*

China University of Geosciences (Beijing) **09. 2012 – 07. 2016**
Bachelor in Geology *Beijing, China*

LABORATORY EXPERIENCE

- **Experimental petrology:**
  1 atm gas mixing furnace
  Over 300 runs with 1 atm high to low-temperature experiments, kinetic cooling experiments
  Piston cylinder apparatus:
  Experienced in 1-2GPa half inch experiments, capsule, assemblage preparation
- **Electron microprobe:**
  Over 1000 hours experience with EPMA, experienced in instrument calibration, analytical method development, high precision measurement, mapping
- **Scanning Electron Microanalysis:**
  Imaging of BSE and SE

- **X-ray tomography (nanotom system):**
  Experienced in geo-material 3D scanning, data processing
- **NanoSIMS:**
  Two week analytical experience, data reduction on mapping, trace element analysis
- **LA-ICP-MS:**
  Data reduction and analysis

COMPUTER SKILLS

- Fluent in programming with python, including package development, numerical modelling, data analysis, PCA analysis.
- Proficient with Matlab, numerical modelling.
- Standard knowledge of shell scripting, julia, web building language including Django framework, HTML and CSS. Vim enthusiast.
- Experienced with thermodynamic modelling software: alphaMELTs family; MAGEMin; PerpleX
- Experienced with scientific writing in Word, LaTeX, Overleaf
- Experienced in design and editing with Adobe Illustrator, Photoshop, Premiere

FIELD WORK EXPERIENCE

2023 Eifel volcano, *Germany, 2 days*
2022 Fogo volcano, *Cape Verde, 1 week*
2018 Changbai Mountain *North China, Tianchi volcano, 2 weeks*
2018 Yunnan *China Tengchong volcano, 2 weeks*
2018 Emeishan Province *China, 2 weeks*
2018 Zhangjiakou *North China, Yaojiazhuang complex, 1 week*
2014 Akesu, Xinjiang *China, Gold deposits, 3 weeks*
2013 Zhoukoudian *China, field mapping courses, 4 weeks*
2012 Beidaihe *China, excursion, 3 weeks*

PRIZES & AWARDS

2023 University of Münster, Early career postdoc fellowship (declined)
2023 Belgian FWO travel grant for Rocky World III, Zurich, 2023 (€500)
2023 Belgian FWO travel grant for Goldschmidt, Lyon, 2023 (€500)
2018 Institute travel grant for attending Goldschmidt, 2018 (¥12000 = USD 1700)
2018 National Awards for Excellent Graduate Students (¥30,000 = USD 4300, 1%)
2014.12 Third prize in professional course. (15%)
2014.6 Third prize in professional course. (15%)
2014.5 Fourth prize in Institute Scientific Research Activity.

SERVICES

Conference participation:
2023 Primary convenor, Goldschmidt 2023, *Dynamics and timescales in magmatic reserviors, conduits and dikes, (proposal writing, session convenor)*
Journal reviewer:
American Mineralogist, GCA, Communications Earth & Environment

TEACHING

2022 Soil Science & Geology (practical, igneous rocks)
2021 Soil Science & Geology (practical, igneous and sedimentary rocks)

SUPERVISION

1. Soetkin Willemyns, Mantle melting and mantle mineralogy in exoplanets. *Master. 2023*
2. Kinjal Ganguly, Interior structure and mineralogy of exoplanets. *Master. 2023*
3. Lander Cuypers, Experimental study of olivine morphology. *Bachelor, 2021*
4. Sarah Stammen, Experimental study of olivine and spinel equilibrium. *Master. 2020*

PUBLICATIONS

Peer reviewed journal publications

1. Jin Z, **Zhang Y**, Bose M, Glynn S, Couffignal F. (2024). Petrogenesis of Erg Chech 002 Achondrite and Implications for an Altered Magma Ocean. *The Astrophysical Journal 965(1), 24.*
2. Xu Y, Lin Y, Wu P, Namur O, **Zhang Y**, Charlier B. (Accepted in Nature Communication). A diamond-bearing core-mantle boundary on Mercury.
3. **Zhang Y**, Namur O, Li W, Shorttle O, Gazel E, Jennings ES, Thy P, Grove TL, Charlier B. (2023). An extended calibration of the olivine-spinel aluminum exchange thermometer: Application to the melting conditions and mantle lithologies of large igneous provinces. *Journal of Petrology 64(11), p.egad077.*
4. **Zhang Y**, Namur O, Charlier B. 2023. Experimental study of high-Ti and low-Ti basalts: liquid lines of descent and silicate liquid immiscibility in large igneous provinces. *Contrib. Mineral. Petrol. 178(1):1-24.*
5. Pirotte H, Cartier C, Pommier A, Namur O, **Zhang Y** Berndt J, Klemme S, Charlier B. 2023. Internal differentiation and volatile budget of Mercury inferred from trace element partitioning experiments at highly reduced conditions. *Icarus. 115699*
6. Vlieghe, M., Rochez, G., Pire-Stevenne, S., Storme, J.Y., Dekoninck, A., Vanbrabant, Y., Namur, O., **Zhang, Y.**, Van Ham-Meert, A., Donnadieu, J.P. and Berbigé, M., 2023. Ni-rich mineral nepouite explains the exceptional green color of speleothems. *Scientific Reports, 13(1), p.15017.*
7. Dekoninck A, Rufet G, Baptiste J, Wyns R, Philippo S, **Zhang Y**, Namur O 2022. Petrogenesis and $^{40}Ar/^{39}Ar$ dating of epithermal romanechite from the sub-aerial fault-related Romanèche Mn deposit (France). *Chemical Geology. 121280*
8. **Zhang Y**, Hou T, Veksler IV, Lesher CE, Namur O, 2018. Phase equilibria and geochemical constraints on the petrogenesis of high-Ti picrite from the Paleogene East Greenland flood basalt province. *Lithos, 300-301,20-32.*

PhD thesis

Zhang Y. 2024. Magmatic differentiation and thermal structure in large igneous provinces

Manuscripts under review

1. Li W, Shorttle O, Maclennan J, Matthews S, **Zhang Y**, Namur O, Soderman C, Geist D. (under review in JPET). Taking the temperature of ocean islands: a petrological approach.
2. **Zhang Y**, Charlier B, Krein SB, Grove TL, Namur O, Holtz F. (under review in EPSL). The very late-stage crystallization of the lunar magma ocean and the composition of immiscible urKREEP.
3. Jin Z, Hou T, Zhu MH, **Zhang Y**, Namur O., (under review in AM). Late-stage microstructures in Chang'E-5 basalt and implications for the evolution of lunar ferrobasalt

Manuscripts in progress

1. **Zhang Y**, Namur O, Hakim K, Dasgupta R, Shorttle O. (in prep). Forming Mercury-analog exoplanets in the solar neighborhood.
2. **Zhang Y**, Namur O, Charlier B, Shorttle O, Holness MB (in prep). An experimental and thermodynamic model for olivine growth rate and morphology.

Conference abstracts

1. **Zhang Y**, Charlier B, Grove TL, Brown SM, Namur O, Holtz F. The very late-stage crystallization of the lunar magma ocean and the composition of immiscible urKREEP. Rocky Worlds III Zurich. *poster*
2. **Zhang Y**, Namur O, Charlier B, 2023. Magmatic differentiation and silicate liquid immiscibility in large igneous province. EMPG-XVIII 2023. *oral*
3. **Zhang Y**, Namur O, Charlier B, Holness MB, 2023. A general model for olivine growth rate and morphology. Goldschmidt 2023. *poster*
4. Namur O, Tosi N, Shorttle O, Cartier C, Lin Y, **Zhang Y**, Saracino F, Liado L, Pirotte H, Charlier B. 2023. Mercury's mantle as constrained by its crust. Goldschmidt 2023. *keynote talk*
5. Saracino F, Charlier B, **Zhang Y**, Namur O, 2023. The role of sulfur on liquidus temperature and olivine-orthopyroxene equilibria in highly reduced magmas. Goldschmidt 2023. *poster*

6. Pirotte H, Cartier C, Pommier A, Namur O, **Zhang Y** Berndt J, Klemme S, Charlier B. 2023. Investigating Mercury's internal structure and volatile budget using trace elements partitioning experiments. Goldschmidt 2023. *poster*
7. Shepherd K, Namur O, Bachmann O, **Zhang Y**, Hendrickx T, Charlier B, 2022. Timescales and Petrological Processes in an Area of Plume-Ridge Interaction: Insights from the Islands of Terceira and Flores, Azores. AGU 2022 *oral*
8. **Zhang Y**, Namur O, Charlier B, Li W, Shorttle O, Gazel E, Jennings ES, Thy P, Grove TL, 2022, A re-evaluation of Al-in-Olivine geothermometer. Goldschmidt 2022 *oral*
9. **Zhang Y**, Namur O, Charlier B, 2020. Experimental liquid lines of descent and Silicate Liquid Immiscibility for low-Ti and high-Ti basalts of the Emeishan Large Igneous Province, SW China. AGU 2021. *poster*
10. **Zhang Y**, Namur O, Charlier B, 2020. Experimental liquid lines of descent for low-Ti and high-Ti basalts of the Emeishan Large Igneous Province, SW China. EMPG-XVII 2020. *poster*
11. **Zhang Y**, Hou T, Veksler IV, Lesher CE, Namur O, 2018. Phase equilibria and geochemical constraints on the petrogenesis of high-Ti picrite from the Paleogene East Greenland flood basalt province. Goldschmidt Abstract 2018. *oral*

INVITED TALKS

1. **Zhang Y**. Magmatic differentiation and thermal structure of large igneous provinces *2023. Guangzhou Institute of Geochemistry, Chinese Academy of Sciences.*
2. Namur O, Charlier B, Cartier C, **Zhang Y**, Nittler M, Collinet M, Grove T, McCammon C. Sulfur chemistry in planetary interiors - Effects of reducing conditions. *2023. Department of Physics and Astronomy, KU Leuven.*
3. Namur O, Tosi N, Shorttle O, Cartier C, Lin Y, **Zhang Y**, Saracino F, Liado L, Pirotte H, Charlier B. Mercury's mantle as constrained by its crust. *Goldschmidt 2023 keynote talk.*

CODE DEVELOPMENT

1. Li W, **Zhang Y** – pyAp, a package for calculating magmatic volatile, trace element concentrations, and oxygen fugacity using mineral apatite. *python*
2. **Zhang Y** – Mass balance calculation for petrology using non-negative and matrix decomposition algorithms, with MCMC propagating errors on phases and bulk composition. *python*
3. **Zhang Y**, Namur O, Gerve TDV – Multi-component olivine diffusion, integrated with uncertainties of temperature, pressure, oxygen fugacity. *python*
4. **Zhang Y** – Stepwise backward F-test model for multiple linear regression. *python*
5. **Zhang Y** – Script converts alphaMELTS output to formatted spreadsheet. *python*

References

1. Olivier Namur (KU Leuven, Belgium): olivier.namur@kuleuven.be
2. Bernard Charlier (University of Liège, Belgium): b.charlier@uliege.be
3. Oliver Shorttle (University of Cambridge, UK): os258@cam.ac.uk
4. Weiran Li (The University of Hong Kong, China): weiranli@hku.hk

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