UNIVERSITÀ DEGLI STUDI DI MILANO

TO MAGNIFICO RETTORE OF UNIVERSITA' DEGLI STUDI DI MILANO ID CODE 5994

I the undersigned asks to participate in the public selection, for qualifications and examinations, for the awarding of a type B fellowship at **Dipartimento di Scienze della Terra Ardito Desio**

Scientist- in - charge: **Prof. Poli Stefano**

[Chao WANG]

CURRICULUM VITAE

PERSONAL INFORMATION

Surname	Wang
Name	Chao

PRESENT OCCUPATION

Appointment	Structure
Postdoctoral Fellow	Short-term, post-doctoral fellowship

EDUCATION AND TRAINING

Degree	Course of studies	University	year of achievement of the degree
PhD	Metamorphic Petrology, Experimental Petrology, Geochemistry etc. (please see the attached transcript of the PhD studies in detail.)	Peking University (PKU)	2023
Joint PhD Student	Geomicrobiologie, Nano-characterization technology	Institut de physique du globe de Paris (IPGP), Paris, France	2022.10 - 2023. 07
Joint PhD Student	High temperature and high pressure experimental technology	Center for High Pressure Science and Technology Advanced Research (HPSTAR), Beijing, China	2020.10 - 2022.10
BSc	Resources Exploration Engineering	Central South University (CSU)	2018

REGISTRATION IN PROFESSIONAL ASSOCIATIONS

Date of registration	Association	City
13.05.2021	European Association of Geochemistry (EAG)	Online, Goldschmidt2021

15.01.2023	American Geophysical Union (AGU)	Washington, D.C., USA
17.01.2023	The Mineralogical Society of America (MSA)	Chantilly, Virginia, USA
22.02.2023	American Association for the Advancement of Science (AAAS)	Washington, D.C., USA

FOREIGN LANGUAGES

Languages	level of knowledge
English	Fluent
Chinese	Natives

AWARDS, ACKNOWLEDGEMENTS, SCHOLARSHIPS

Year	Description of award
2023	Münster Early Career Postdoctoral Fellowships in Geosciences, University of Münster
2023	Top 100 Outstanding Doctoral Thesis, Peking University
2022	President Scholarship for PhD Students, Peking University
2022	China Scholarship Council (CSC) Fellowship, The Chinese Ministry of Education
2020	Excellent Student Leader, Peking University
2019	Award for Scientific Research, Peking University
2018	Outstanding Graduate, Educational Commission of Hu'nan Province of China
2016	National Scholarship, The Chinese Ministry of Education

TRAINING OR RESEARCH ACTIVITY

[1] PhD Research, PKU, 2018–2022
Favorable P-T-fO_2 conditions for abiotic CH_4 production in subducted oceanic crusts: Petrological investigations and thermodynamic simulations

- Investigating carbon-bearing phases (including both fluid inclusions and minerals) and their interrelationships in eclogites by Raman spectroscopy and electron microscopy characterizations
- Analysis of Fe^{3+} content in garnet by EPMA Flank method to estimate the fO_2 of rocks
- Recreate the P-T-fO_2 evolution and specific original carbon species by thermodynamic models
- Successfully established a paradigm for studying carbon phases in rock-buffered high-pressure thermodynamic systems

[2] PhD Research, PKU & HPSTAR & IPGP, 2020–2023
Origins of deep abiotic hydrocarbons: Insights from fundamental redox reactions within the Fe-C-H-O system

- Developed a method for in-situ parallel experiments in DAC to study water-rock reactions, e.g., multiple-holes-chamber and real-time Raman monitoring
- Analysis of trace gases in quenched large-volume-press samples using gas chromatography
- Combining thermodynamic simulations and high-P experimental results to constrain specific reactions in P-T space
- Accumulated experience in characterizing tiny organic-bearing phases, including FIB-SEM-TEM, TOF-

SIMS, Nano-IR
- Heavy hydrocarbons have been synthesized for the first time by pure inorganic chemical reactions in the high-pressure environment (1-10 GPa) of the Earth's mantle

[3] PhD Research, HPSTAR, 2020–2021
High P-T vibrational properties and anharmonicity of $FeCO_3$ and $MnCO_3$ up to 50 GPa and 1100 K by Raman spectroscopy
- Successfully modified BX90 DAC to reach a high temperature of 1100 K with resistance heating
- The P-T calibrants of siderite and rhodochrosite are developed based on the functional relationship of ν_i-P-T which can be used for studying water-carbonate interaction at high P-T conditions in a DAC
- Developed a method to calculate the temperature dependence of the bulk modulus K(T) by combining Raman frequency shifts and the first-order Murnaghan equation of state
- Determination of the isobaric and isothermal equivalents of the mode Grüneisen parameter and the anharmonic parameter
- Rechecked phase transition pressures for siderite and rhodochrosite

[4] PhD Research, HPSTAR, 2022–2023
Methane in water at high pressures: Investigation of immiscibility behaviors
- Successfully modified the BX90 DAC with mechanical engineers to be connected with the automatic pneumatic pressure controller
- Modification of commercial membrane-type DAC to allow heating to 1100 K
- Construction of Raman monitoring platform adapted to resistive heating-coupled DAC
- Establishment of phase diagrams associated with fluid immiscibility behaviors in P-T-X space through in-situ high P-T experimental simulations

[5] Undergraduate Research, CSU, 2016–2018
Trace elements characteristics of zircons from the Dahutang W-bearing Granites: Insights into multistage W-polymetallic mineralization
- Preliminary understanding of zircon chronology and trace element geochemistry
- Preliminary involvement in field geological investigations of economic mineral deposits
- Understanding of LA-ICP-MS analysis for zircon samples

PROJECT ACTIVITY

Year	Project
2020-2025	National Key Research and Development Program of China, "Production of abiotic methane during subduction", Main executors of the project.
2022-2025	National Natural Science Foundation of China (NSFC) Major Research Plan on West-Pacific Earth System Multispheric Interactions, "Carbon cycle progress during the subduction of the western-Pacific-plate and the origin of decratonic gold deposits", Main participants in the project.

PATENTS

None

CONGRESSES AND SEMINARS

Date	Title	Place

11.07.2023	Origins of deep abiotic hydrocarbons: Insights from fundamental redox reactions within the Fe-C-H-O system	Lyon, France, Goldschmidt2023- Session 1bP1
06.12.2022	P-T-fO_2 conditions for abiotic methane formation in oceanic subduction zones: a comprehensive constraint from petrological observations, high-temperature and high-pressure experiments, and thermodynamic modelings	Beijing, China, Annual Meeting of Chinese Geoscience Union (CGU)
25.07.2022	High-pressure and high-temperature vibrational properties and anharmonicity of siderite (FeCO3) and rhodochrosite (MnCO3) up to 47 GPa and 1100 K by Raman spectroscope	Hawai'i, USA, Goldschmidt2022- Session 2bT2
09.07.2021	Formation of abiotic CH4 in UHP eclogites from SW Tianshan subduction zone: Implications for redox state of subducting slabs and deep carbon cycle	Online, Goldschmidt2021-Session 2h
05.07.2021	Favorable temperature, pressure, and oxygen fugacity conditions for the formation of abiotic hydrocarbons within high-pressure subduction-zone water-rock reactions	Guiyang, China, The 8th "From Atom to Earth" Symposium on High-pressure Science and Earth Science
17.04.2021	Formation of abiotic CH4 in UHP eclogites from SW Tianshan subduction zone: Implications for redox state of subducting slabs and deep carbon cycle	Xi'an, China, The 9th National Metamorphic Rock Professional Committee Academic Symposium

PUBLICATIONS

- Research article

[1] **Chao Wang**, Renbiao Tao, Jesse B. Walters, Heidi E. Höfer, Lifei Zhang (2022). Favorable P-T-$fO2$ conditions for abiotic CH4 production in subducted oceanic crusts: A comparison between CH4-bearing ultrahigh-and CO2-bearing high-pressure eclogite. ***Geochimica et Cosmochimica Acta***, 336, 269-290.

[2] **Chao Wang**, Lu'an Ren, Jesse B. Walters, Lifei Zhang, Renbiao Tao (2023). In situ Raman vibrational spectra of siderite ($FeCO_3$) and rhodochrosite ($MnCO_3$) up to 47 GPa and 1100 K. ***American Mineralogist***, 108(2), 312-325.

[3] Lu'an Ren, **Chao Wang**, Renbiao Tao, Xiaowei Li (2022). Raman shifts of c-BN as an ideal P-T sensor for studying water-rock interactions in a diamond anvil cell. ***American Mineralogist***, 108(3), 455-464.

[4] Jingbo Nan, Zidong Peng, **Chao Wang**, Dominic Papineau, Zhenbing She, Zixiao Guo, Xiaotong Peng, Junlie Zhou, Yingjie Hu, Weiqi Yao, Ruiling Zhang, Changle Wang, Renbiao Tao (2023). Molecular mechanism of metamorphic alteration on early life traces in banded iron formations. ***Earth and Planetary Science Letters***, 615, 118226.

[5] Mingbao Li, Yan Fan, P. M. Ranjith, Ke Zhu, **Chao Wang**, Wen Yu, Shijie Li (2023). A two-component model of UPB: evidence from a unique ureilite NWA 11562. ***The Planetary Science Journal***. In revision.

- Articles in reviews

[1] **Chao Wang**, Renbiao Tao, Jesse B. Walters, Tianshi Ren, Jingbo Nan, Lifei Zhang (2023). Deciphering

the origin of abiotic organic compounds on Earth: review and future prospect. ***Acta Geologica Sinica***, 97(1), 288-308.

• Congress proceedings
[1] Chao Wang, Lifei Zhang, Jesse B. Walters, Renbiao Tao (2021). Formation of abiotic CH4 in UHP eclogites from SW Tianshan subduction zone: Implications for redox state of subducting slabs and deep carbon cycle. *Goldschmidt2021*.
[2] Chao Wang, Renbiao Tao, Lu'an Ren, Jesse B. Walters, Lifei Zhang (2022). High-pressure and high-temperature vibrational properties and anharmonicity of siderite (FeCO3) and rhodochrosite (MnCO3) up to 47 GPa and 1100 K by Raman spectroscopy. *Goldschmidt2022*.
[3] Chao Wang, Renbiao Tao, Lifei Zhang, Baptiste Debret, Jesse B. Walters, Chunyuan Lan, Xi Zhu, Kai Yang, Benedicte Menez (2023). Origins of deep abiotic hydrocarbons: Insights from fundamental redox reactions within the Fe-C-H-O system. *Goldschmidt2023*.

OTHER INFORMATION

• Working papers
[1] Chao Wang, Renbiao Tao, Bénédicte Menez, Baptiste Debret, Lu'an Ren, Jesse B. Walters, Chunyuan Lan, Jinzhong Liu, Jingbo Nan, Carmen Sanchez-Valle, Ho-kwang Mao, Lifei Zhang. Various deep abiotic hydrocarbons feed the planetary chemical habitability. In preparation.
[2] Chao Wang, Shijie Li, Bénédicte Menez, Yangting Lin, Renbiao Tao. The evolution of carbon-bearing phase in 2008TC3 and JaH809: Implications for the origin of UPB. In preparation.
[3] Chao Wang, Renbiao Tao, Shijie Li, Bénédicte Menez. Discovery of organic components in Ureilite. In preparation.
[4] Chao Wang, Renbiao Tao, Bénédicte Ménez, Qingyang Hu, Jesse B. Walters, Carmen Sanchez-Valle, Ho-Kwang Mao, Lifei Zhang. Redox reactions and phase relationships in the Fe-C-H-O system down to the deep lower-mantle. In preparation.
• Relevant research skills
[1] *High-pressure Equipment:* Diamond anvil cell (BX90, HDAC, MDAC, S-DAC, etc., including resistive heating and laser heating (YAG and CO_2 source) technologies) (5-100 GPa); Large-volume press (Piston cylinder (1–3 GPa), Cubic apparatus (3–6 GPa))
[2] *High-temperature Equipment:* Heating stages filled with protective gas for in-situ observation (e.g., Linkam heating stage); Vertical tubular furnace (1700 °C); Chamber Furnace (8 L, 1700 °C)
[3] *Spectroscopy:* Raman (Horiba, Renishaw, Witec, and hand-assembled), FTIR (Bruker VERTEX 70v, Molecular Vista One for nano-IR), XRD (Malvern Panalytical Empyrean for powder XRD; ESRF ID15B, Spring-8 XU10 and DESY P02.2 for S-XRD)
[4] *Electron Microscopy*: SEM (FEI Quattro-S, JEOL JSM-7900F, FEI Quanta-650), EPMA (JEOL JXA-8530F, JEOL JXA-8230), FIB-SEM (FEI Helios 5CX), TIMA (FEG3 LMH 119-0205)
[5] *Elemental Analysis*: LA-ICP-MS (GeoLasPro 193 nm ArF excimer laser + Thermo X2 ICP-MS)
[6] *Thermodynamic Simulation*: Perple_X (Calculate subsolidus reaction and devolatilization reaction within 5 GPa; Develop thermodynamic database related to carbon-bearing mantle peridotite systems up to 30 GPa.), DEW+EQ3/6 (Simulate fluid-rock reaction within 5 GPa)
[7] *Sample Preparation*: Cutting machine, Polishing machine, and other high-pressure associated support equipment

Declarations given in the present curriculum must be considered released according to art. 46 and 47 of DPR n. 445/2000.

The present curriculum does not contain confidential and legal information according to art. 4, paragraph 1, points d) and e) of D.Lgs. 30.06.2003 n. 196.

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Place and date: Münster, 17/11/2023