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OF THE MINERALOGICAL SOCIETY

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A note from the editors…

Welcome to the June edition of The Applied Mineralogist! In this edition we explore some fascinating advances and get introduced to some exciting upcoming events and new publications. Don't forget to try out the new code word puzzle and find out the winner of #thinSectionThursday.

Within this issue Peirou Li introduces a fascinating report on their recent exhibition of research into vanadium mining waste at the Engineering Geology for a Habitable Earth conference in China for our Bursary report, and Martin Li provides an insightful report for our special feature looking at tracking HREE mineralisation in granites using zircons.

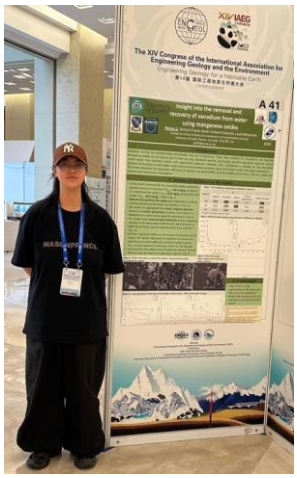
Thank you to those who contributed and we hope you enjoy this months publication.

AMG Bursary Report

"Engineering Geology for a Habitable Earth"

Peirou Li, *Camborne School of Mines, University of Exeter*

XIV IAEG Congress, Chengdu, China. 21-27th Sept 2023.



"I am grateful to the Applied Mineralogy Group of the Mineralogical Society of Great Britain and Ireland for awarding me a Student Bursary in 2023 to attend the XIV IAEG Congress 2023 for "Engineering Geology for a Habitable Earth" from 21 to 27th September, 2023

My research is focused on vanadium mining waste and manganese oxides. My work included comparing the performance of natural manganese oxide deposits, commercial manganese oxide, and manganese oxides synthesized by hydrothermal methods to adsorb vanadium. Initial results showed that the natural manganese nodules sorbed the greatest amount of V (Q_{max} = 54.0 mg/g) compared to the other two types of manganese oxide (commercial manganese oxide: Q_{max} =10.4 mg/g, synthetic manganese oxides: Q_{max} =26.0 mg/g). The regeneration of manganese oxide and recovery of vanadium are being investigated, and investigation of the mechanism of vanadium adsorption by manganese oxide is ongoing (considering surface multilayer sorption, chemisorption and physisorption). I gave a poster presentation during the session: T4: Geoenvironmental Engineering and Ecological Solutions & T7: Deep Earth Resource and Energy Exploitation &T9: Technological Innovation in Engineering Geology (3rd Shaoxing International Forum). The XIV IAEG Congress 2023 for "Engineering Geology for a Habitable Earth" was a perfect fit to present my research and it was a fantastic opportunity to discuss my project with industrial and academic participants.

Highlights

Bursary Report: Peirou Li

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Special Feature: Martin Li

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ADVERTS

-

Puzzle: Code word

-

#ThinSectionThursday winner

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Upcoming events

The conference was held in Century City International Convention Centre, Chengdu, China. I had a very productive week, attending many fantastic talks/posters on a broad range of subjects, arranged potential collaborations with colleagues, had some very interesting discussions and made many new connections which will be beneficial in developing the technological potential of my project.

I am most grateful to the AMG Committee for supporting my attendance at the conference".

Special Feature

Tracking HREE mineralisation in granites through zircon texture and composition

Martin Li, School of Applied Sciences, University of Brighton, Brighton

Rare earth elements, especially the heavy REE, are increasingly important in various high-technological applications and the electrification of transport for a carbon-neutral society. Unlike the light REE that are mined from hard-rock resources, such as carbonatites and alkaline intrusions, HREE are mainly extracted from low-grade weathered granitoid deposits in adsorbed form on clay minerals [1]. Often, the HREE is sourced from the parent granitoids, which mostly show extensive hydrothermal overprinting. However, the hydrothermal process responsible for the HREE mineralisation has not yet been well characterised. Zircon, as a common REE-bearing accessory mineral in these systems, commonly records the magmatic-hydrothermal history and could be a powerful tool to help reconstruct the evolution of such systems. Detailed characterization of consecutive growth zones that record the magmatic to hydrothermal processes could further potentially provide more in-depth illustration of the geochemical evolution.

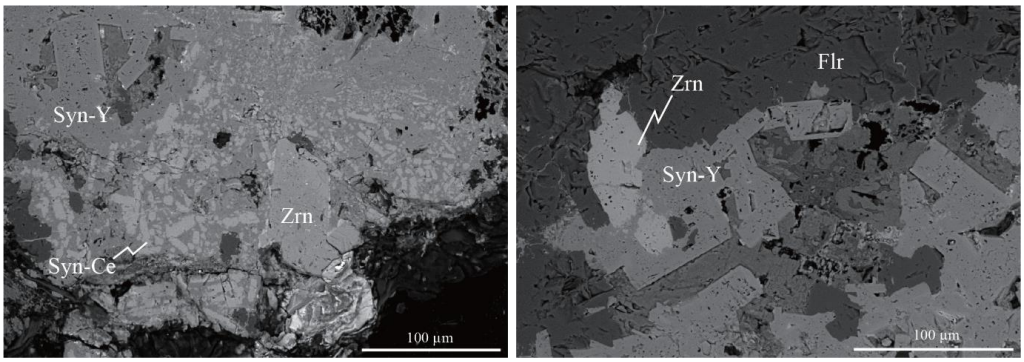


Figure 1. Back-scattered electronic images of the HREE mineralisation in the Zudong granites. Abbreviation: Syn-Ce – synchysite-(Ce); Syn-Y – synchysite-(Y); Flr – fluorite; Zrn – zircon

Through the study of zircon from the Zudong pluton in South China, which is the bedrock of the world's largest regolith-hosted HREE deposit [2] and itself also holds extremely high concentrations of HREE, multiple stages of hydrothermal re-mobilisation of the REE could be unlocked, accounting for the HREE mineralisation [3]. The Zudong pluton is a multi-stage intrusive complex of an early phase of granodiorite and biotite granite and a late phase of muscovite-bearing alkaline granite. The muscovite-bearing alkaline granite is highly enriched in HREE, with concentrations up to 8,000 ppm and chondrite-normalised La/Yb ratio as low to 0.1. Albite, K-feldspar, quartz, and muscovite are the major minerals of this phase, with muscovite appearing as a product of biotite alteration. The HREE mineralisation is mainly due to the precipitation of synchysite-(Y), and sub-ordinately gadolinite, hingganite, yttrialite, xenotime, zircon, euxenite, and fluorite (Figure 1). Zircon of the Zudong granites is highly metasomatised and shows complicated internal texture. Often, the zircon grains are composed of a magmatic core rimmed consecutively by a porous, inclusion-rich overgrowth and a clean, inclusion-free overgrowth, and the two types of overgrowth usually occur repetitively after the other. The alternating dissolution-reprecipitation and continuous growth of the zircon is likely caused by the interaction between hydrothermal fluid and zircon. Occasionally, both the porous and clean overgrowths are further overprinted by irregular and inward-penetrating patchy reaction zones probably through a diffusion-reaction process. Correspondingly, the fluid-zircon interaction is associated with significant enrichment of the non-formula elements, including the REE, in the clean growth zones and comparative depletion of these elements in the porous growth zones (Figure 2). The alternating dissolution-reprecipitation and continuous growth of the zircon can be attributed to the fluctuations in the F activity of the fluid. REE were repeatedly mobilised and enriched in the fluid to precipitate the major HREE mineral synchysite-(Y), and partially incorporated into the growth zone of zircon while other elements were largely lost to the fluid during extensive dissolution of the rock-forming minerals. LREE were also likely substantially mobilised in the late hydrothermal stage and lost through complexation with Cl, causing the significant LREE depletion and thus REE fractionation. This process continuously enriched host granites in the HREE and transferred the HREE from refractory phases, such as xenotime and zircon, to more weathering susceptible phases, including synchysite-(Y) and gadolinite-(Y). Altogether the hydrothermal process is critical in making the Zudong granites a potential resource and favourable protoliths for the supergene regolith-hosted HREE deposits.

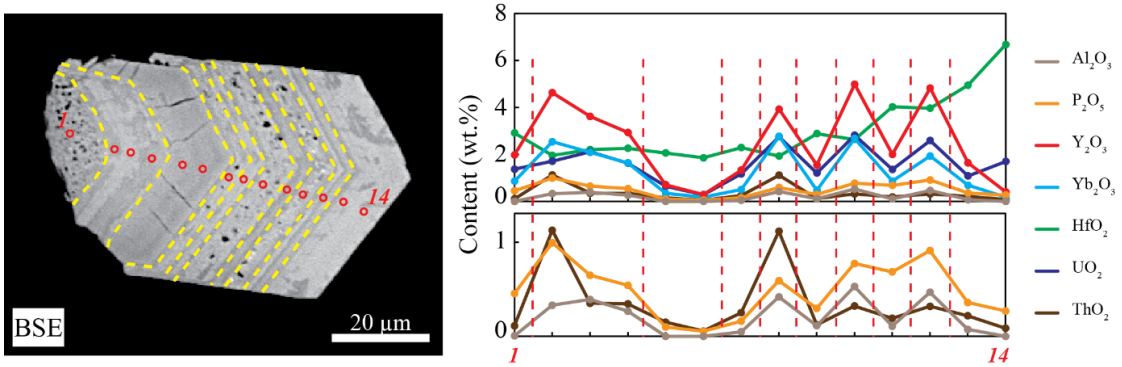


Figure 2. Variation of elemental composition (determined by EPMA) of a representative zircon in the Zudong granites.

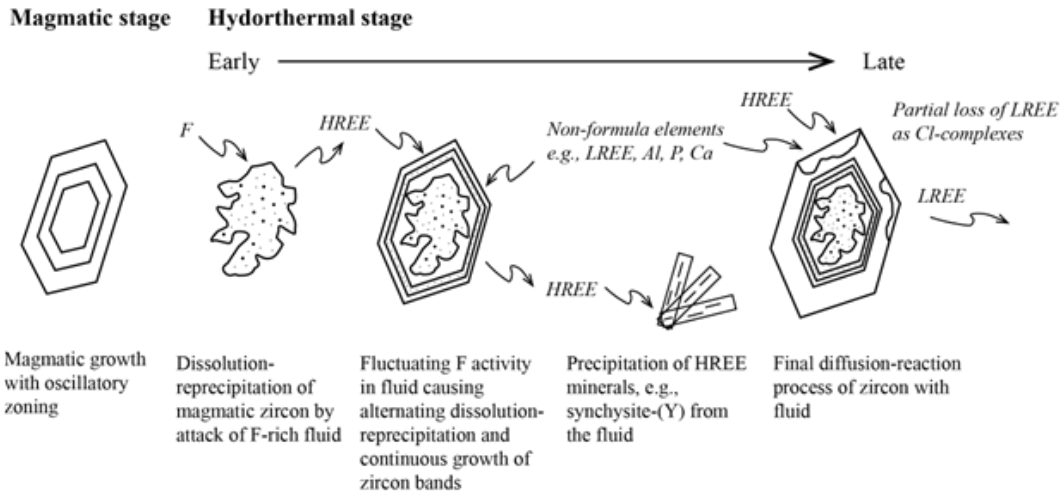


Figure 3. Magmatic to hydrothermal zircon evolution

References
[1] Li, Zhao and Zhou, 2017, Journal of Asian Earth Sciences 148, 65-95
[2] Li, Zhou and Williams-Jones, 2019, Economic Geology 114, 541-568
[3] Li and Zhou, 2024, American Mineralogist, doi.org/10.2138/am-2023-9117

European Mineralogical Conference (EMC) 2024

Location – Dublin, Ireland

Dates – 18th – 23rd August 2024

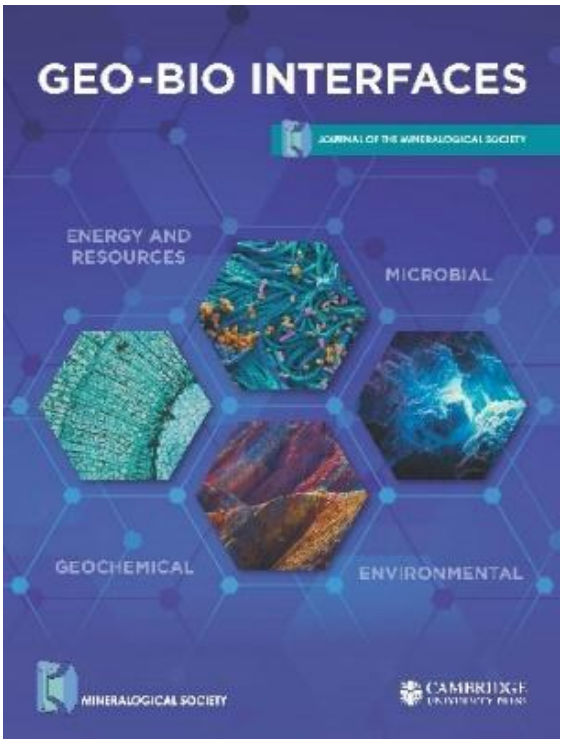
The first draft of the EMC 2024 programme has been released at https://emc-2024.org/programme/.

This EMC conference will present sessions that will be of interest for applied mineralogists including: 1 – CO_2 capture and storage, 2 – Primary ore deposits, 3 – Critical metals, 4 – Process mineralogy and recycling / the circular economic and 5 – Gem minerals.

The conference will hold over 30 sessions with over 500 presentations on offer.

There's still time to register, this is the conference you can't miss!

GEO-BIO INTERFACES



The Mineralogical Society of the UK and Ireland and Cambridge University Press have come together to publish a **new journal, Geo-Bio Interfaces**: (https://www.cambridge.org/core/journals/geo-bio-interfaces) .

We at the Applied Mineralogy Group thought you might be interested in the journal and wanted to invite you to think about contributing an article.

Geo-Bio Interfaces aims to answer fundamental and emerging questions in geoscience and bioscience, by exploring contemporary scientific disciplines and the interconnection between them. The journal covers four primary spheres of academic interest that intersect with the geo- and biosciences: microbial, environmental, geochemical, and energy and resources. It will publish its first articles this year and, once it matures, is expected to be indexed by an array of high-quality indexing services, including the Directory of Open Access Journals (DOAJ), Scopus and Web of Science, and receive an Impact Factor.

The Editors (below) would be very interested in talking with you to discuss your research and to determine if and when you might be able to contribute an article to this exciting new journal. If you know of anyone else who might be interested in contributing, please feel free to connect them directly with me or one of the journal's three principal Editors.

Jon Lloyd *University of Manchester, UK.* *jon.lloyd@manchester.ac.uk*
Annette Engel *University of Tennessee-Knoxville, USA.* *aengel1@utk.edu*
Hailiang Dong *China University of Geosciences - Beijing, China. dongh@miamioh.edu*

This is an Open Access journal. We recommend that you visit the 'Transformative Agreements' page: https://www.cambridge.org/core/services/open-access-policies/read-and-publish-agreements at the Cambridge website to check for your institution's status.

By publishing in a Society journal, you help to support the community: the Society through its partnership with Cambridge supports the activity of eight special interest groups, membership (including free membership for students), bursaries for students and established researchers, conferences (many of which are free and all of which are available in hybrid form), awards and much more. And together with Cambridge we have a strict focus on quality and timeliness of production of our three journals.

With best wishes,

Martin Smith and Hannah Grant
Chair/Secretary, Applied Mineralogy Group of the Mineralogical Society

Code Word

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
17	26	20																							

A B C

8 19 8 12 12 19 18 17 4 14 5 26 24 19 18 11 20 7 12

C A

16 18 11 16 5 18 3 9 20 22 11 12 5 4 17 4 13 16 11 3 8 12 22 5 13

C A B A B A A

20 17 4 26 5 17 12 26 5 17 24 19 8 6 24 3 17 12

A C A B

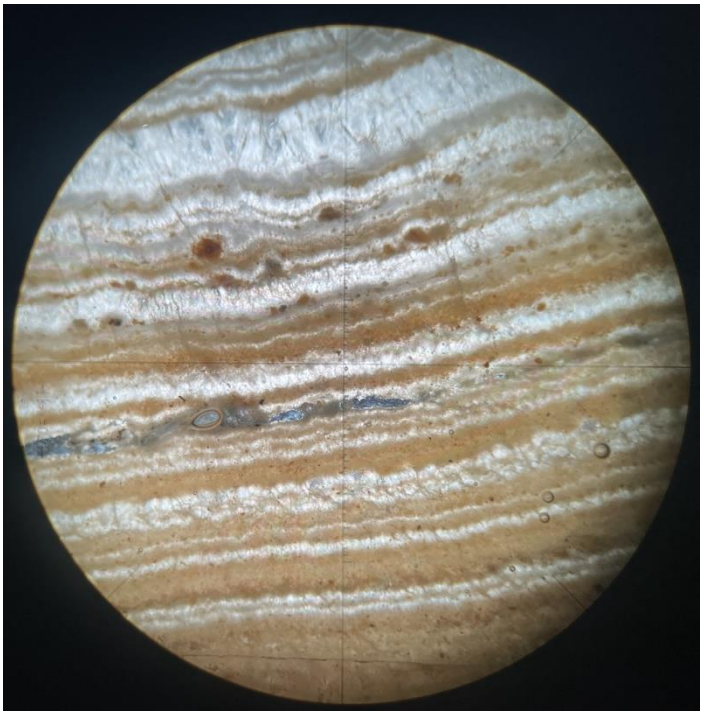
6 3 11 1 5 18 12 17 4 13 15 24 20 22 15 11 18 5 13 24 18 17 26 3 5

A A C A

8 12 17 17 20 17 12 8 15 11 2

- ***Fill out the number corresponding letters to spell out a geo-quote and its author.***

#ThinSectionThursday Winner!



Thin section or a planet?

Captured by a student in EPS Professor Dr. Linda Kah's Earth Sedimentary Processes (GEOL 340) course.
This image shows a beautiful section of a travertine/speleothem captured through a microscope.

Repost from @UTK_EEPS by @NickDygert

If you would like to become more involved in the AMG, elections are held yearly at the AGM. Spaces for Student Representatives come up regularly. If you would like to be considered for a committee spot please email Martin Smith (Chair).

BURSARIES.
The AMG provides bursaries for postgraduate students in the disciplines of Applied Mineralogy, Crystallography, and Petrology and Geochemistry. Bursaries are intended to support conference attendance and associated travel costs, although other activities may be considered. Application guidelines can be found at: www.minersoc.org/amg-bursaries

Please note there are two bursary application deadlines each year: 15th April and 15th October. Requests for funding must be received well in advance of the event to allow for consideration by the committee.

FUNDING.
We welcome applications from both individuals or organisations for funding in support of events covered in the AMG remit. Further guidelines on how to apply can be found at: www.minersoc.org/amg-funding

Don't forget to keep posting with #ThinsectionThursdays, #FieldworkFridays, #MineralMondays, and #AppliedMineralogy for your chance to be featured.

A NOTE FROM OUR EDITORS.
Thank you to those who have contributed to this issue of Applied Mineralogist. Please forward any articles, comments or notices of events and conferences to amgminsoc@gmail.com.

All previous issues of Applied Mineralogist are available at: **www.minersoc.org/amg-applied**

Code Word Answers

A	B	C	D	E	F	G	H	I	J	K	L	M
17	26	20	13	5	6	14	22	8	10	7	3	15
N	O	P	Q	R	S	T	U	V	W	X	Y	Z
4	11	16	25	18	12	19	24	2	1	23	9	21

'It is strange, but rocks properly chosen and polished can be as beautiful as flowers and much more durable' – Isaac Asimov.

Interested in joining the Mineralogical Society and Applied Mineralogy Group?

Go to:
https://www.minersoc.org/

Upcoming Events:

EMC: 18th-23rd August 2024

IGC: 25th-31st August 2024

SEG: 27th-30th September 2024

AMG