

BSc (YangonU), F.G.A. (London), MSc (Queen's University, Canada), PhD (UTas)

Senior Research Fellow

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Career Summary:

Khin Zaw is a Senior Research Fellow, CODES ARC Centre of Excellence in Ore Deposits, University of Tasmania, Australia. He received a BSc from Yangon University, Myanmar, in 1968, FGA Diploma (Fellowships of Gemmological Association of Great Britain) in 1969, MSc (Economic Geology) from Queen's University, Canada in 1976 and PhD from University of Tasmania in 1990. He is also a Fellow of the Australasian Institute of Mining and Metallurgy. He has over 35 years experience working on genetic aspects of mineral deposits in Canada, Australia, New Zealand, China and SE Asia, and has published a considerable number of papers relating to ore genesis and mineral exploration in Australasian region. He is actively linked with counterpart geologists from SE Asia region. **He is currently completed editing and contributing papers for a special volume of Mineral Deposits of South China in peer reviewed 'ORE GEOLOGY REVIEWS' journal. He is also organizing a section on SE04: Tectonics and Metallogeny in Asia and Oceania as a Main Convener at 4th Asia-Oceania Geological Society (AOGS) Conference in Bangkok, Thailand.**

Research Interests:

Khin Zaw undertakes research on a variety of ore deposit styles from skarn, VHMS, vein-type W-Sn, to porphyry related skarn/epithermal deposits. His PhD research was to understand the skarn system overprinted on the Rosebery VHMS deposit. Khin Zaw maintains a balance of his applied industry-funded research and basic ARC funded fundamental research on ore deposits. He is also a recognised geoscientist on the application of fluid inclusion and isotopic research to the study of ore fluids chemistry. He is currently leading an ARC Linkage Project on the 'Geochronology and Metallogensis of Loei fold belt in Thailand and Laos'.

Research Areas:

Major research expertise and research projects: He has undertaken the following research programs for which the results have been already published or to be published in recognised Earth Science Journals:

1. Detailed mineralogical, petrological and geochemical studies including fluid inclusion analysis to investigate the origin and environment of skarn and ore deposition at

CanTung Mine, one of the richest skarn-type tungsten deposits in western world, Northwest Territories, Canada.

2. Geology and genesis of a Mississippi-Valley type deposit at Theingon Mine, Bawsaing, Myanmar.

3. Fluid inclusion study of W-Sn veins at Hermyingyi and Mawchi Mine, Myanmar.

4. Petrology and geochemistry of mineralised and barren granitoid intrusions with special reference to the emplacement of tin-tungsten mineralisation: Metallogeny of Burmese Sn-W deposits; application of bedrock geochemistry to the selection of target areas for prospecting of Sn-W deposits in Myanmar.

5. Origin of the volcanic-hosted Pb-Zn-Cu-Ag-Ba deposit at Bawdwin Mine and sediment-hosted Pb-Zn deposits at Yadanatheingi Mine, Northern Shan State, Myanmar.

6. Alteration and mineralisation of Monywa porphyry Cu-Au deposit, central Myanmar.

7. Fluid inclusions as a guide to exploration at Tennant Creek goldfield, Northern Territory, Australia.

8. Geochemical, stable isotope (C, O, S, H) and fluid inclusion study on F(J) lens, South-end orebodies at Rosebery Mine, a volcanic-hosted Au-rich massive sulphide deposit, Tasmania.

9. Mineralogical, isotopic, and fluid inclusion study on precious metal mineralisation at J(K)-P lens of Hercules Mine and South Hercules deposit, Tasmania.

10. Mineralogy and geochemistry of epithermal systems, Thames goldfield, North Island, New Zealand.

11. Fluid inclusion composition studies (PIXE, LRS, FTIR, SEM/EM and mass spectrometric analyses) on VHMS deposits at Hellyer, Tasmania and Mt Chalmers, Queensland, Australia.

12. GIS, Geological and metallogenic relation studies of mineral deposits in SE Asia/south China: their potential and prospectivity.

13. Fluid/melt characteristics and chemistry of gem sapphires in SE Asia, Australia and Tasmania.

14. Source of ore-forming fluids and mixing processes of recent hydrothermal systems in Okinawa Trough, Japan and Middle Valley, northern Juan de Fuca Ridge.

15. Tectonic and metallogenic relations of SE Asia and South China

Student Supervision

1991- Supervision of a number of honours projects, M.Sc. and PhD students: Genesis of the Kara scheelite skarn deposit (M.Econ.; Blackwell, 1993–95); Carlin-type Fu Ning gold deposit, Yunnan, China (M.Econ.; Chromie, 1998–2001); Genesis of corundum minerals in southern Thailand: constraints from fluid inclusions and experimental studies (PhD; Phisit Lintrakun, 1997–2001); Geological setting, mineralogy, alteration and nature of ore fluid of the H zone, the Chatree deposit, Thailand (MSc; Kamonporn Kromkhun, 2003–2005); Anthony Harris (Postdoc-Loei ARC linkage project); Visiting Research Fellows: Mr. Lasse Telstø, Department of Geology and Mineral Resources Engineering, Norwegian University of Science and Technology, Trondheim, Norway, (2001); Associate Professor Dr. Xianbio Lu, China University of Geosciences, Wuhan, China, (2002–2003) and Mr. Somboon Khositant, Senior Geologist and Endeavour Australia Cheung Kong Fellow, Department of Mineral Resources, Bangkok, Thailand (2007–).

Current MSc/PhD students:

Takayuki Manaka, MSc

Epithermal low-sulphidation system at Ban Houyxi and LCT deposits, Lao PDR

The LCT and Ban Houayxi epithermal gold deposits are located in Lao PDR, approximately 100km northeast of the capital Vientiane, at the intersection of the Loei and Truongson Fold Belts. The project include (1) prospect-scale geological mapping to characterise the host rocks and structure, (2) detailed mineragraphic studies to establish the paragenetic relations and mineral chemistry studies, (3) detailed documentation of alteration assemblages, metal distribution and zonation along selected cross-sections, (4) LA ICP-MS analyses of trace elements in pyrite to understand the chemical environment of ore deposition, (5) sulphur and oxygen isotopes and fluid inclusion studies, including laser Raman spectroscopy analysis of ore fluids to obtain P-T-X conditions of the system, and (6) development of an ore deposit model based on the field and laboratory data to understand the nature and origin of ore formation and to apply the model to target the high-grade part of the mineralised system. This research project is funded by ARC Loei Linkage project and Pan Australian Resources N.L. Company.

Teera Kamvong, PhD

Geology and genesis of porphyry-skarn Cu-Au deposits at the northern Loei Fold Belt, Northeast Thailand and Laos

The Loei Fold Belt exhibits one of the greatest endowments of economic metal deposits (e.g., epithermal Chatree gold deposit, Thailand, porphyry-skarn Puthep copper-gold deposit, Thailand and porphyry-skarn Phu Kham copper-gold deposit, Laos) in mainland South East Asia. The aim of this research is to undertake an integrated study of geology, mineralogy, fluid inclusions and isotope geochemistry in the northernmost part of the Loei Fold Belt, focusing on the area of the Puthep 1 copper deposit in the northeastern region of Thailand and the Phu Kham copper-gold deposit in Laos. The Puthep 1 (PUT 1)

deposit contains 44 million tonnes at 0.5 % Cu, and the Phu Kham deposit has a geological resource of 64 million tonnes at 0.9 % Cu and 0.4 g/t Au. The research will determine the spatial, temporal, and genetic relationships between porphyry-skarn environments and their associated intrusions on the regional and deposit scale, and to constrain the metallogeneses and to develop the ore genetic model of the northernmost portion of the Loei Fold Belt so critical to mineral exploration activities in the region. This research project is funded by UniTas IPRS scholarships, SEG student Foundation, ARC Loei Linkage project and Pan Australian Resources N.L. Company.

Asalam Abhisit, PhD

Geological, paragenesis and geochronological relations of the Chatree area, Phetchabun Province, central Thailand

The Chatree epithermal deposit contains 22.7 million tons at 2.34 g/t Au and 16 g/t Ag and is located in the Loei Fold Belt which extends from the coast in the southern gulf of Thailand through central Thailand up north into Laos. The regional geological setting of the Loei Fold Belt is characterised by Middle Palaeozoic to Cenozoic volcanic and sedimentary rocks. This research project is to develop a geological, geochronological, mineral paragenesis, and geochemical framework in relation to mineralisation in the Chatree area. The main goal of the research is to develop a detailed genetic model applied to exploration. The role of volcanic host rocks and intrusions in controlling source of ores, ore-forming fluid mechanisms, and the spatial distribution of different mineralisation styles on the district scale will also be investigated to understand the metallogenic evolution of the region. This research project is funded by UniTas IPRS Scholarships, ARC Loei Linkage project and Akara/Kingsgate Consolidated Company.

Paul Cromie, PhD

Geological setting, geochemistry and genesis of the Sepon Mineral District, Lao PDR

The Sepon Mineral District (SMD) occurs within the NW-trending Truongson Fold Belt in Savannakhet Province, south-eastern Laos. Geology of the SMD is dominated by Devonian to Carboniferous aged continental fluvial and shallow to deep marine sedimentary rocks that were deposited in a half graben basin and intruded by Early Permian Rhyodacite Porphyry (RDP). Gold in the SMD is predominantly micro-disseminated and show similarities with Carlin-type deposits in Nevada, USA. The SMD contains 4.1 million ounces of gold and adjacent copper skarn-gold mineralisation covers a variety of primary and secondary styles such as the Khanong copper deposit (40Mt @ 2.9% Cu). The aims of the PhD project are to document the: (1) geological characteristics, (2) ore-mineral paragenesis and nature of gold occurrence, and; (3) investigate the geochemistry associated with gold and copper mineralisation to: (a) aid in the development of a model to explain the genesis of the deposits, and (b) establish exploration criteria and vectors towards finding gold at Sepon. This research project is funded by APA Scholarships, CSIRO Scholarships, SEG student Foundation and Oxiana Limited Company.

Singoyi Blackwell, PhD

Textures and trace element geochemistry of magnetites from hydrothermal deposits

Magnetite is a common iron oxide mineral in many giant ore deposits such as Olympic Dam in South Australia and Cadia in NSW. However, chemical analyses of individual mineral grains were hampered by high detection limits in electron probe micro-analysis and use of techniques such as XRF or solution chemistry on mineral separates was associated with problems of contamination by foreign mineral inclusions. Application of the LA ICP-MS technique allows us to select very small spots (5 to >120 μ m) on mineral grains that are largely free of inclusions for analysis at low (<1ppm) detection limits and provide more information on trace elements in individual magnetite, thus leading to better understanding how ore deposits form. This research will generate magnetite compositional data and other data largely from deposits with well-constrained geology. The main objectives of this PhD project are to: (1) determine the range of trace elements in magnetite (and hematite) by LA ICP-MS from a variety of hydrothermal deposits, (2) investigate magnetite trace element compositional variations in time and space, (3) establish the physical-chemical conditions associated with the formation of the hydrothermal magnetite mineral assemblages in the selected deposits, and (4) assess the application of magnetite trace element compositional variation as a tool in mineral exploration and targeting ore-rich zones as well as a criterion for discriminating deposits. This project is funded by UniTas IPRS scholarships, CODES Scholarships, SEG student Foundation and Newcrest Company.

Memberships

1. Fellow of the Gemmological Association of Great Britain
2. Member of the Society of Economic Geologists
3. Member of the Society for Geology applied to Mineral deposits
4. Member of the Association of Geoscientists for International Development
5. Fellow of the Australasian Institute of Mining and Metallurgy
6. Member of International Association on the Genesis of Ore Deposits (IAGOD)