

Investigating mineralisation processes and novel processing techniques for critical metal by-products in the Mbe gold deposit, Central Cameroon

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Project Highlights:

- First study of a newly discovered gold deposit in Central Cameroon, working with Oriole Resources on an exciting field exploration programme.
- Use cutting edge laboratory techniques to answer key research questions with implications for orogenic gold deposit formation models and regional exploration.
- Test novel Deep Eutectic Solvent (DES) processing techniques to extract gold and critical metal tellurium from this deposit.

Overview:

Orogenic gold deposits are the one of the world's main sources of gold but can also contain critical metal by-products such as tellurium, which is essential for the green transition as a component of solar panels. Extraction of these by-products can be challenging with traditional processing methods, and controls on the mineralogy and by-product potential of these deposits are still not fully understood. This project provides an opportunity to study a newly-discovered orogenic gold deposit in Cameroon, investigating its ore forming processes and applying novel processing techniques to see if tellurium can be recovered as a by-product.

Oriole Resources PLC is a UK-based exploration company focused on gold exploration and development in Cameroon with multiple orogenic gold related projects. This research project will focus on an early-stage orogenic gold prospect within Oriole's greenfield Mbe licence in central Cameroon. Since Mbe was granted in 2021, Oriole has completed regional scale soil and stream sampling, and local scale infill soil sampling, geological mapping, rock chip sampling, and trenching sampling, identifying multiple prospects within the licence area. A maiden ~6,800m drilling programme at the MB01-S sub-prospect was completed in September 2025 with best intersections including 86.50m at 1.36g/t Au and 6.15m at 19.67g/t Au. The characterisation of gold within the system (distribution, associated mineralogy etc.) is still at an early stage with preliminary work indicating that, unusually, much of the gold is present as telluride minerals, which is more commonly associated with magmatic-hydrothermal epithermal gold deposits. This, coupled with the presence of igneous host rocks, may suggest a possible epithermal overprint or involvement of magmatic-hydrothermal fluids. However, the relationship between the mineralisation and the magmatism which formed the host rocks is still unknown, as are the characteristics of the ore forming fluids.

This project will characterise the gold and tellurium mineralisation and the conditions and sources of the ore-forming fluids at Mbe to determine:

- 1) if there was significant magmatic-hydrothermal influence during deposit formation;
- 2) if such an epithermal overprint exists was it gold enriching
- 3) whether novel Deep Eutectic Solvent (DES) processing techniques can be used to extract tellurium from this deposit.

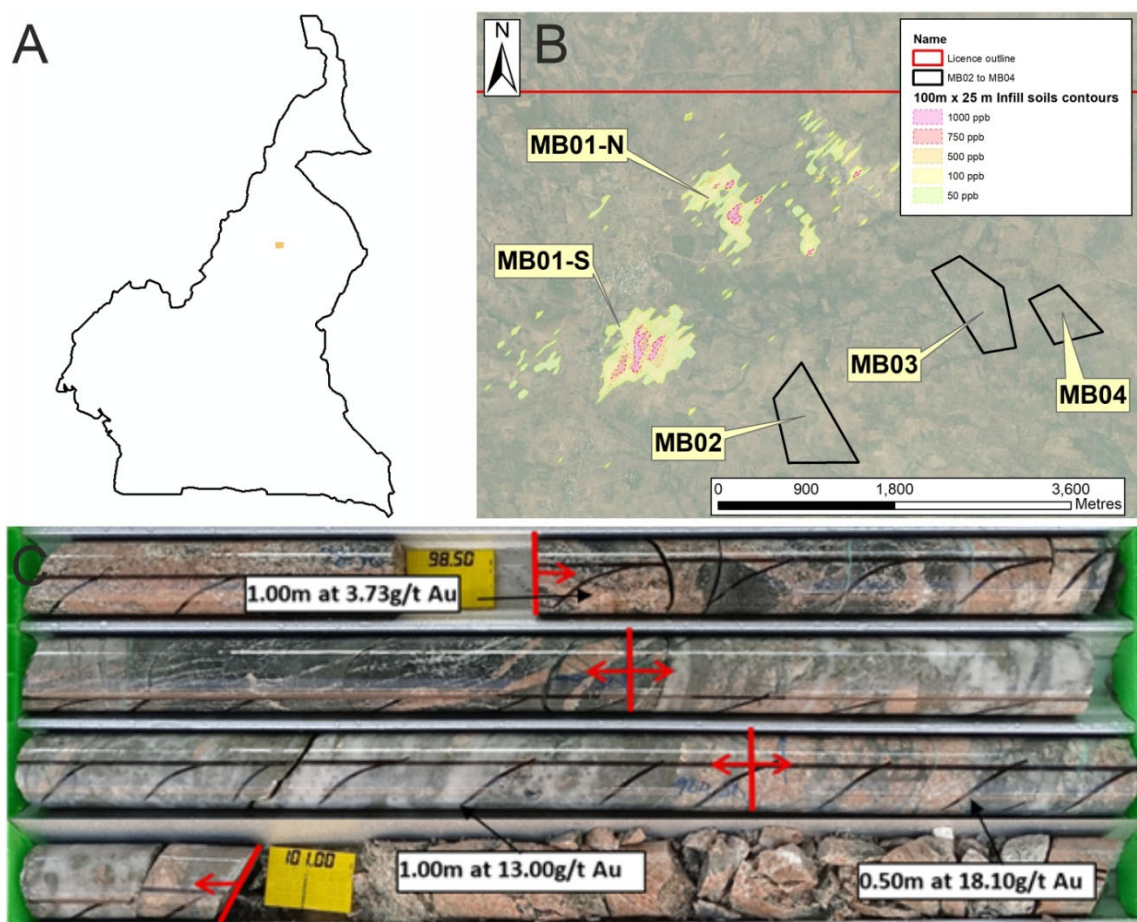


Figure 1: A) Location of Mbe prospect (gold shaded area) within Cameroon. B) Four main prospects identified within the Mbe licence area: MB01- MB04, with MB01-S and MB01-N sub-prospects highlighted. C) Example of gold-pyrite-telluride mineralisation at Mbe from drill core

Methodology:

Characterisation of the mineralisation will be by field mapping and sampling, and logging and sampling of drill core from Oriole Resources' drilling campaign on Mbe. This will be followed by mineralogical analysis using optical microscopy, μ -XRF scanner, scanning electron microscopy (SEM), and automated mineralogy using University of Leicester's Zeiss Sigma 300 with Mineralogic software.

Characterisation of the fluids will be done by fluid inclusion analysis at Leicester and UCL. Stable isotope analysis (S, H, O and potentially C-O) will be undertaken at the NERC isotope facility (SUERC), subject to a successful facility application, and will be used to constrain the source of the fluids and any magmatic influence.

Typical ore minerals, bulk samples and mineral concentrates will be used to test the leaching efficiency of a range of potential DES to provide proof of concept for development of a new mineral processing route that recovers Te alongside Au.

Possible Timeline

Year 1: Literature review, field mapping and sampling and work on drill core from initial drilling campaign to define vein paragenesis. Ore mineralogy using transmitted and reflected light microscopy, μ -XRF, SEM and automated mineralogy by SEM. TARGET training and networking events.

Year 2: Quartz characterisation with cathodoluminescence. Fluid inclusion petrology, including microRaman spectroscopy, and fluid inclusion microthermometry at UCL. Preparation for stable isotope work and pilot stable isotope study and application for full study. Presentation at UK conference in winter and international conference in summer. Continuing TARGET training.

Year 3: Stable isotope analysis at SUERC, DES test work at Leicester. Preparation of thesis and manuscripts for publication. Presentation of work to Oriole Resources, at national and international conferences.

Training and skills:

TARGET researchers will participate in a minimum of 40 days training over the 3.5 years of study composed of:

- an annual one-week workshop dedicated to their year group, and tailored to that cohort's needs in terms of skills development – *for the first three years of their study*;
- an annual all-TARGET workshop with cross-year interactions, advanced training and opportunities to specialise in particular areas – *all years of study*;
- a number of one-day workshops;
- additional online events and in-person workshops attached to relevant conferences.

Project-specific training will include lab training (e.g. SEM automated mineralogy, fluid inclusions) and field training (e.g. core logging).

Partners and collaboration (including CASE):

Oriole Resources PLC will provide logistical support during field work, samples, and data. The successful applicant will have regular progress meetings and opportunities for discussion with Oriole Resources personnel, as well as gaining field experience in relation to an early-stage exploration programme at a greenfield project.

The successful applicant will be based at the University of Leicester and will visit UCL for blocks of time to use lab facilities. Regular project meetings will take place involving all supervisors. JLS at Cardiff will provide expertise in west-African orogenic gold systems and support for fieldwork and lab facilities.

Further reading:

Gaboury, D. (2019) 'Parameters for the formation of orogenic gold deposits', *Applied Earth Science*, 128(3), pp. 124–133. doi: 10.1080/25726838.2019.1583310.

Groves, D.I., Santosh, M., Deng, J., Wang, Q., Yang, L., Zhang, L., 2020. 'A holistic model for the origin of orogenic gold deposits and its implications for exploration.' *Mineralium Deposita* 55, pp. 275–292. <https://doi.org/10.1007/s00126-019-00877-5>

Jenkin GRT, Al-Bassam AZM, Harris RC, Abbott AP, Smith DJ, Holwell DA, Chapman RJ, Stanley CJ (2016). The application of deep eutectic solvent ionic liquids for environmentally-friendly dissolution and recovery of precious metals. *Minerals Engineering*, 87, 18-24. DOI: 10.1016/j.mineng.2015.09.026

Spence-Jones C, Jenkin GRT, Boyce AJ, Hill NJ, Sangster CJS (2018). Tellurium, magmatic fluids and orogenic gold: An early magmatic fluid pulse at Cononish gold deposit, Scotland. *Ore Geology Reviews*, 102, 894-905. DOI: 10.1016/j.oregeorev.2018.05.014

Further details: <https://orioleresources.com/projects/mbe/>

Please visit <https://target.le.ac.uk/> for additional details on how to apply. For project enquiries please contact grtj1@leicester.ac.uk. For more information on Leicester's Centre for Sustainable Resource Extraction visit: <https://le.ac.uk/csre>.