

# SEG 2022 Conference: Minerals For Our Future

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## Importance of Foundational Petrology and Geochemistry for Evaluating Igneous Sources to Base Metal Mineralization in SW Ireland

Paul Slezak<sup>1</sup>, Murray W. Hitzman<sup>1</sup>, David van Acken<sup>2</sup>, Eoin Dunlevy<sup>1</sup>, David Chew<sup>3</sup>, Foteini Drakou<sup>3</sup>, Mark Holdstock<sup>4</sup>

1. Irish Centre for Research in Applied Geoscience, University College Dublin, Dublin, Ireland, 2. National Centre for Isotope Geology, University College Dublin, Dublin, Ireland, 3. Department of Geology, Trinity College Dublin, Dublin, Ireland, 4. Group Eleven Mining & Exploration Ltd, Dublin, Ireland

County Limerick contains the largest exposure of Carboniferous igneous rocks in Ireland, which occur as diatremes, lava flows, dykes, hypabyssal intrusions, and tuffs that are collectively known as the Limerick Igneous Suite (LIS). The LIS is comprised of two smaller, separate igneous packages: 1) the Knockroe igneous units, which range from alkaline basalts to trachyandesites, and 2) the Knockseefin igneous units, which range from alkaline basalts to basanites. Both units have undergone significant amounts of chlorite-calcite  $\pm$  prehnite alteration, minor pyrite mineralization, and are spatially associated with multiple Zn-Pb sulfide prospects in SW Ireland.

Uranium–Pb dating of apatite establishes an igneous crystallisation age of c. 350 Ma for the Knockroe units. Bulk rock Sr and Nd isotopes from the least altered Knockroe samples range from 0.70301–0.70454 and 0.512457–0.512493, respectively. Strontium isotopes for the least altered Knockseefin samples range from 0.70325–0.70386 and the Nd values range from 0.512431–0.512437. Altered samples are buffered against changes in Nd, but some analyses show excursions towards radiogenic Sr, indicating contamination from Carboniferous seawater and/or introduction of Rb. The latter alteration returned ages within uncertainty of the U–Pb dates.

The world-class Lisheen and Silvermines deposits are ~50 km north of the LIS and have Re–Os ages of  $346 \pm 3$  Ma and  $334 \pm 6$  Ma, respectively, which correspond to the ages of the LIS. However, the Nd and Sr isotope signatures from the LIS are very different than those previously obtained from gangue carbonate and barite associated with hydrothermal Zn-Pb-Fe sulfides at the Navan Mine. Using the results from Navan as a proxy for Irish-type mineralization suggests the LIS is not necessarily a mineralization source. However, the U–Pb ages indicate the LIS may have been a heat source along the Iapetus Suture Zone, which could have helped to drive Irish-style mineralizing systems.