

SEG 2024 Conference: Sustainable Mineral Exploration and Development

Monazite-Rich Carbonatite Dykes at Eureka, Namibia

Sam Broom-Fendley¹, Ed Loye¹, Pete Siegfried¹, Tolene Kruger², Chris Drysdale², Tim Smalley², Rainer Ellmies³, Frances Wall¹

1. University of Exeter, Penryn, United Kingdom, 2. E-Tech Resources, Halifax, NS, Canada, 3. Gecko Exploration, Windhoek, Namibia

Rare earth element (REE)-bearing dolomite carbonatites at Eureka Farm 99, Namibia, contain abundant low-Th monazite-(Ce) crystals, which can reach up to 20 cm in length. The locality was first documented in the 1960's, but a detailed understanding of the deposit has been hampered by Quaternary cover, compounded by the tendency of the carbonatites to occur in low, weathered depressions in the landscape. Diamond drilling by E-Tech Resources has shed new light on the genesis of this deposit and demonstrates that the carbonatite dykes consist of an assemblage of three rock types. These comprise a core unit of variably-mineralised dolomite carbonatite, with magnetite, pyrrhotite, monazite, and minor calcite; an outer zone termed "dalmatian carbonatite" consisting of calcite, olivine, serpentine, pyrrhotite, magnetite, and graphite; and a skarn rock, termed "GCARB," consisting of diopside, tremolite-actinolite, pyrrhotite, graphite, and large monazite crystals with locally developed allanite-apatite coronas. All of the carbonatites strike roughly parallel to the fabric developed within intensely deformed schists and quartzites of the Etusis Formation of the Damara Supergroup. Previously published ⁸⁷Sr/⁸⁶Sr isotope data support a mantle origin, with only minor crustal input, and U-Pb dates of 548 ± 4 Ma suggest a Pan-African related event was important in petrogenesis. It is possible that the monazite-(Ce) may have recrystallized at this time. Based on the contact relationships observed, and the published isotopic data, the deposit is interpreted as a metamorphosed carbonatite, with the surrounding monazite-bearing silicate rocks (GCARB) interpreted as a reaction product between the carbonatites and surrounding siliceous country rocks. This interpretation suggests other metamorphosed carbonatites may be present within Etusis age (and older) rocks of the Damara Supergroup, and further exploration of the Eureka dome, by E-Tech Resources Inc., has uncovered several new localities up to ~3.5 km from the main Eureka deposit composed of similar monazite-bearing calc-silicate rocks.