Characterization and Origin of the REE-bearing Magmatic-hydrothermal breccia pipes in the Gallinas Mountains, Lincoln County, New Mexico

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Breccia pipes are a common host of many precious and base metal and rare earth elements (REE) mineral deposits because they provide conduits for fluid flow and open spaces for mineral precipitation, hence are a focus area for exploration. The Gallinas Mountains district in Lincoln County, New Mexico has produced copper, lead, silver, fluorite, iron, REE (as bastnaesite), and gold from 1902 to 1980, but no production has been reported from the breccia pipes. However, some magmatic-hydrothermal breccia pipes in the Gallinas Mountains host high concentrations of fluorite-REE and gold. Previous studies have described the occurrence of REE in breccia pipes, but the controls for their transportation and deposition are still unclear. The purpose of this research is to characterize the magmatic-hydrothermal breccia pipes in order to understand the geochemical and physical conditions of deposition of REE and gold in the breccia pipes found in the Gallinas Mountains.

There are more than 20 exposed breccia pipes that intrude the Yeso Formation, Glorieta Sandstone, trachyte, and syenite, forming a northeast-trending belt, approximately 3–5 kilometers long in a fault block northwest of the Pride fault. The breccia pipes are gray to brown and consist of angular to subrounded fragments of granite, granitic gneiss, sandstone, shale, limestone, trachyte, and syenite that are as much as 1 m in diameter. The majority of the breccia pipes are matrix-supported with a groundmass of feldspar and quartz, along with small crystals of other minerals and rock fragments. Significant number of these breccia pipes are altered and weathered, consisting of secondary hematite and local calcite, quartz, and fluorite. Some rock fragments are silicified around their edges and other fragments are surrounded and cut by fluorite veins. Fragments of magnetite-hematite ore are found in several breccia pipes. Chemically, the breccia pipes exhibit light REE-enriched chondrite-normalized patterns. Samples with high fluorine also have high REE and some have high gold concentrations. Some breccia pipes contain as much as 28,485 ppm total REE and 121 ppb Au. Preliminary studies suggest that the breccia pipes are magmatic and intruded into the host rocks and, subsequently, hydrothermal fluids precipitated fluorite-REE and gold along the edges of some breccia pipes. Additional studies are underway to further test this hypothesis.

References:


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