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Geology of the REE Mineral Deposits in the Gallinas Mountains (Gallinas District), Lincoln County, New Mexico; Update from New Mapping and Geochemical Sampling

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Rare earth elements (REE) are critical minerals that are essential in the electronics, automotive, and metallurgical industries. REE deposits are found in New Mexico, but they have not been important exploration targets in past years because supply has been met elsewhere. However, with a projected increase in demand, New Mexico deposits are being re-examined for their REE potential. Current, new geologic mapping and petrographic, mineralogical, and geochemical analyses in the Gallinas Mountains, New Mexico are being conducted, where past production of REE, as bastnaesite, occurred in the 1950s. Copper, silver, lead, zinc, iron, and fluorite also have been produced from the district. Host rocks include Proterozoic granite and gneiss overlain by Permian sedimentary units belonging to the Abo, Yeso, and Glorieta formations. The mineral deposits are also hosted by several textural varieties of 28-30 Ma, alkaline to alkalic-calcic, peraluminous trachyte and syenite sills and dikes. Additional igneous rocks include older andesite and Cougar Mountain trachyte/trachyandesite (~38 Ma) and a younger, fluorite-bearing rhyolite laccolith (28-30 Ma). The Red Cloud Canyon fault forms a major north-trending fault system that is downthrown to the west. No significant mineral deposits are found along the Red Cloud Canyon fault, but along smaller fault spays and fracture zones. New mapping and chemical analyses have allowed defining six types of mineral deposits in the district distinguished by mineralogy, chemistry, and style: REE-F veins, Cu-REE-F (± Pb, Zn, Ag, Au) veins, F veins, intrusive breccia pipes, carbonate breccias, and iron skarn-contact replacement deposits. The REE-F, Cu-REE-F, and F veins are hydrothermal, with variable fluorite and barite, low in sulfur, and controlled by minor faults, fractures, and bedding planes. Most veins are <20 m long and typically <1.5 m wide. New veins have been mapped that have expanded the mineralized area for exploration. The magmatic, intrusive breccia pipes form a north-east-trending belt approximately 2 km long. Breccia pipes are matrix-supported, pipe-like bodies that intrude the trachyte and Yeso and Glorieta formations and consist of angular to subrounded fragments of sandstone, shale, limestone, granite, granitic gneiss, and trachyte/syenite that are as much as 1 m in diameter. The contacts are covered and are not well exposed, but the pipes appear to be roughly elliptical in shape. Most of the breccia pipes are cemented by quartz, feldspar, fluorite, and hematite along with small crystals of other minerals and rock fragments, and locally host REE-F and F veins and anomalously high gold values (as much as 222 ppb). Electron microprobe studies indicate that the predominant matrix is albite, with local trachytic or porphyritic texture. Carbonate breccias are found in the vicinity of thin limestone and gypsum (?) beds in the Yeso Formation and many contain fluorite, local trace gold (as much as 178 ppb), and variable amounts of REE. Iron skarn-contact replacement deposits consist of hematite and magnetite, with local elevated REE, replacing Yeso limestone and Yeso and Glorieta sandstone. Different alteration styles are associated with the veins, breccia pipes, skarns, and trachyte/syenite sills/dikes and are under study.