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GEOLOGY AND MINERAL DEPOSITS IN THE CAPITAN MOUNTAINS DISTRICT,
LINCOLN COUNTY, NEW MEXICO

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The Capitan pluton, which lies along the east-west trending Capitan lineament (Allen and McLemore., 1991; Allen and Foord, 1991), is the largest exposed Tertiary intrusion (outcrop area of approximately 280 sq km) in New Mexico. The best estimate of the age of the pluton is 28.8 Ma, based on $^{40}\text{Ar}/^{39}\text{Ar}$ dating of adularia that is associated with emplacement of the pluton (Dunbar et al., 1996). The east-west trend of the Capitan pluton reflects the influence the Capitan lineament had on controlling pluton emplacement (McLemore and Zimmerer, 2009). The Capitan pluton is associated with REE-Th-U(\pm Au) vein, Fe skarn and vein, and manganese vein and replacement deposits.

The Capitan pluton is a calc-alkaline granite that consists of three textural zones: outer granophyric (~200 m thick), intermediate aplitic (~200 m), and inner porphyritic core (>1,000 m) zones. The textural zones are chemically distinct, suggesting a relationship to magmatic and chemical processes, not simple cooling (Allen and McLemore, 1991). Chemically the Capitan pluton is subalkaline, metaluminous to peraluminous, plots in the WPG (within-plate granites) field of Pearce et al. (1984), and is enriched in light REE (Fig. 1). The linear variation in $\text{Na}_2\text{O}+\text{K}_2\text{O}/\text{SiO}_2$, SiO_2 vs. TiO_2 , and SiO_2 vs. Zr/TiO_2 , and various major elements confirm that the textural zones are comagmatic (Allen and McLemore, 1991).

Fine-grained texture, porous zones (i.e. open fissures and miarolitic cavities) in the granohyritic and aplitic zones, and porphyritic texture all suggest a rapid, shallow crystallization of the magma (Allen and McLemore, 1991; Dunbar et al. 1996). Rare exposures show that the northern and southern contacts with Paleozoic sedimentary rocks dip slightly away from the pluton. The western and eastern intrusive are steeply dipping to vertical. Flat-lying roof pendants of Paleozoic limestone and sills on the western end suggest the pluton is a laccolith or batholith (Allen and McLemore, 1991). No stopping or assimilation of the sedimentary rocks by the pluton has been observed.

Older, large rock glaciers are common in areas where the granite is porphyritic and younger, less developed rock glaciers are found where the granite is aplitic and granophyric (Blagbrough, 1999). Extensive alluvial fans, consisting of granite, limestone, sandstone, and magnetite-rich clasts, surround the eastern porphyritic zone, indicating a pre-erosion cap of Paleozoic sedimentary rocks with local iron deposits. Anomalous concentrations of manganese and iron were found in the alluvial fans adjacent to the intrusive contact during a stream sediment survey (Ellinger, 1988; Ellinger and Cepeda, 1991) and the NURE (National Uranium Resource Evaluation, McLemore, 1981) stream-sediment data.

The REE-Th-U(\pm Au) veins occur exclusively in the granophyric and aplitic zones along the western end of the pluton. Iron skarn and vein deposits are found along the western and northeastern portions of the pluton in all three zones. Manganese deposits are found along the northeastern portion of the pluton, in the porphyritic zone. The REE-Th-U(\pm Au) veins contain quartz, fluorite, adularia, hematite, calcite, fluorite, titanite, allanite, thorite, chlorite, and clay minerals (McLemore and Phillips, 1991). They probably formed from magmatic fluids as indicated by highly saline (as much as 80% eq. NaCl) fluid inclusions with homogenization

temperatures of 500-600°C (Phillips, 1990; Phillips et al., 1991; Banks et al., 1994; Campbell et al., 1995). The fluid inclusions contain Na, K, Ca, Cl, S, Fe, Mn, Zn, and light REE as determined from crush-leached samples of quartz and fluorite (Banks et al., 1994; Campbell et al., 1995). Similar fluid inclusions are found throughout the granitic rocks of the Capitan pluton. Porous zones, characterized by open spaces, bubble-like features, miarolytic cavities, and open fractures within the granite are locally associated with REE-Th-U(\pm Au) veins. These are found only in the granophyric zone; and are interpreted as pathways that allowed fluids to move through the magma into the outer zones of the pluton, forming the REE-Th-U(\pm Au) veins (Dunbar et al., 1996).

Three samples of the REE-Th-U(\pm Au) veins contain higher concentrations of REE than the unaltered/unmineralized Capitan granites and all vein samples are elevated in light REE (Fig. 1). One sample from the McCory prospect contained 8,133 ppm total REE (V.T. McLemore, unpublished data). A sample from the Fuzzy Nut prospect contained 1,110 ppm Th (Tuftin, 1984). Alteration of adjacent rocks to the veins includes minor silification, hematization, and sericitization.

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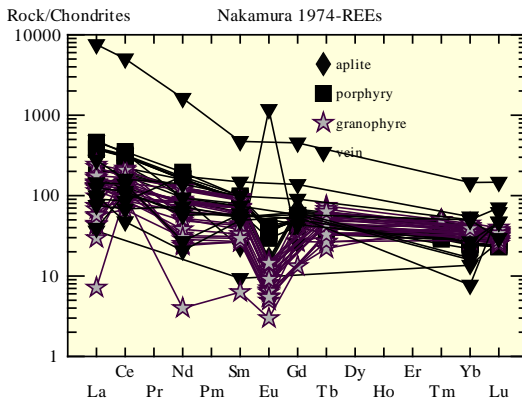


FIGURE 1. REE plots of granitic rocks and REE-Th-U veins in the Capitan Mountains, Lincoln County. Eu was not analyzed in some vein samples. Chondrite values from Nakamura (1974). Data from Allen and McLemore (1991) and V.T. McLemore (unpublished data).