

CAMBRIAN-ORDOVICIAN(?) RARE EARTH ELEMENT (REE)-BEARING EPISYENITES IN THE CABALLO AND BURRO MOUNTAINS, SOUTHERN NEW MEXICO: INSIGHTS INTO A METASOMATIC ORIGIN

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Numerous occurrences of brick-red, K-feldspar-rich rocks, called episyenites, were discovered in the Caballo and Burro Mountains during exploration for U in the 1950s and 1960s. The term episyenite, as used by Leroy (1978), describes rocks that were desilicated and metasomatized by alkali-rich fluids solutions, possibly related to alkaline or carbonatite magmas. The episyenites in the Caballo and Burro Mountains replace the original Proterozoic igneous granites, granodiorites, and gneissic granites, and contain as much as 16% K₂O and have higher concentrations of REE (<1378 ppm total REE), Th (<9721 ppm) and U (<2329 ppm) than most igneous rocks. Field observations and mapping indicate that these episyenites are typically found as flat-lying pods or lenses (<300 m in diameter), pipe-like bodies, and dike-like bodies (<2 m wide and 400 m long). They consist of K-feldspar with varying amounts of quartz, muscovite, hematite/goethite, chlorite, and plagioclase. Accessory minerals include apatite, zircon, calcite, fluorite, limonite, magnetite, barite, and malachite. Some areas have numerous small episyenite bodies in a geographically restricted area, suggesting fracture or fault control. The contacts between the episyenite bodies and the host rocks vary from location to location, from very sharp to distinctly gradational. In places where the contacts are sharp, the episyenites could be interpreted as intrusive primary igneous rocks. However, gradational contacts are more typical. A striking example is the episyenite body located in the Jack Creek rapakivi granite, in the Ramsey Saddle area of the Burro Mountains, which exhibits a strongly gradational contact, transitioning from the buff-colored host rapakivi granite to brick-red episyenite over a distance of 10s of meters. The large rapikivi feldspar crystals, diagnostic of the host granite, are overprinted by the brick-red episyenite, indicating that a fluid-driven metasomatic process was responsible. Similar replacement relationships are observed in other localities, and are reinforced by microbeam observations of feldspar crystal texture and composition (see Riggins et al., this volume). Although multiple origins for episyenite are possible (i.e., igneous and metasomatic), the simplest explanation for the field relationships is that these similar occurrences of brick-red episyenites are all metasomatic in origin. In other geological occurrences of similar types of metasomatic alteration elsewhere in the world, alkaline or carbonatite magmas are thought to be the origin of the REE-bearing metasomatic fluids. Elsewhere in New Mexico, episyenites are found in the Nacimiento Mountains, Pederal Hills, Lobo Hill, and Zuni Mountains. Cambrian-Ordovician carbonatites are found in the Lemitar and Chupadera Mountains, Lobo Hill, Monte Largo (Sandia Mountains) and southern Colorado (Wet Mountains and Iron Mountain); and Cambrian-Ordovician alkali syenites are found in the Florida Mountains. It is possible that all of the episyenites are related to alkaline or carbonatite plutons at depth and are possibly related to the widespread Cambrian-Ordovician magmatic event that occurred throughout New Mexico and southern Colorado (McMillan and McLemore, 2004).