Miarolitic Pegmatites of the Stove Mountain Area in the Colorado Front Range, Colorado Springs. Colorado. *Sarah L. Hanson*[1] and *Gary Zito*[2], [1]Adrian College, Department of Geology and Environmental Science, 110 S. Madison St., Adrian, MI 49221. [2]Colorado School of Mines, Metallurgical and Materials Engineering Department, 1500 Illinois St., Golden, CO 80401.

Pegmatites of the Stove Mountain area, located in the Colorado Front Range near Colorado Springs, occur within the 1.08 Ga Pikes Peak Granite (PPG) as well as in late-stage plutons (Mount Rosa Granite (MRG) and a fayalite granite). Compositionally, the PPG is potassic, with $Na_2O/K_2O < 1.0$, whereas late-stage intrusive rocks are more sodic, with $Na_2O/K_2O > 1.0$. Pegmatites occur in all three units, but miarolitic pegmatites are genetically related to only PPG and MRG. Although pegmatites from both intrusions are often indistinguishable as they are composed of the same major minerals and have some accessory minerals in common, the MRG pegmatites sometimes can be distinguished by the presence of sodic amphibole. These pegmatites have produced diverse mineral assemblages.

Microcline forms gray or pink (½ - 2 cm) crystals that are often highly etched with albite exsolution lamellae preferentially removed. In a few PPG pegmatites, rare deep blue to light blue-green amazonite crystals are present. ***Albite*** occurs as late-stage secondary mineral coatings on earlier formed minerals. ***Micas*** are rare as late-stage hydrothermal activity has either replaced or completely removed them leaving behind holes in mineral clusters. In MRG pegmatites, ***astrophyllite*** occurs as bronze blades or masses (<15 cm) and ***riebeckite*****,** the dominant Na-amphibole, occurs as elongated black crystals.

Fluorite, the most common accessory mineral, ranges from early formed green, to purple, to late-stage colorless crystals. Small amounts of Y sometimes produce yttrofluorite.

Rare-Earth-Element (REE)-bearing minerals include **bastnäsite-(Ce),** which most commonly occurs as root-beer colored, 1-5 mm hexagonal prisms. Yellow ***fluocerite-(Ce)*** crystals sometimes have epitaxial overgrowths of bastnäsite-(Ce) on (0001). This may result from concomitant fluorite growth, which depleted the fluid in F, thereby producing a relative enrichment in carbonate and leading to bastnäsite-(Ce) crystallization over fluocerite-(Ce). **Xenotime-(Y)** forms late, 1-10 mm, often etched, yellow dipyramids on quartz.

Black bladed ***Columbite-(Fe)*** crystals (0.1 - 0.5 cm) rarely reach 2 cm. ***Pyrochlore-group minerals*** (0.1 - 2 cm) are uncommon and form black octahedrons. Often, they exhibit partial surface alteration to a reddish-brown color. ***Ilmenite***, the most common Ti-bearing mineral, occurs as small (0.5 – 2 mm) golden brown to black crystals. Low temperature leaching and oxidation of iron converted some ilmenite to golden brown **pseudorutile**. **Rutile**, resulting from partial or complete epitaxial alteration of ilmenite, exhibits reticulated contact twins on $\{10\bar{1}1\}$. In some MRG pegmatites, niobian rutile is present. ***Hematite*** occurs as rosettes and rarely as black plates up to several mm across. "**Limonite**" commonly replaces earlier formed carbonate minerals.

Abundant, early forming wine red to brown ***zircon*** occurs as anhedral aggregates or euhedral to subhedral dipyramids (<2 cm), sometimes with narrow prism forms. **Bertrandite** from lower Helen Hunt occurs as small (1-5 mm), colorless to white tabular crystals.

Rare ***genthelvite*** occurs as distorted yellow-brown to rose colored octahedrons and dodecahedrons that form overgrowths on red-brown ***danalite***. When present, rare ***fayalite*** forms in black to dark brown, <25 cm pods, one of which was altered to ***protoferro-anthophyllite***. Other rare minerals include ***kainosite-(Y)*** (white, 50-200 μm crystal sprays), ***cassiterite***, ***phenakite***, ***gadolinite-(Y)***, ***hollandite*****, *pyrolusite***, ***wulfenite***, and ***pyrite***.

This large diversity of minerals is attributed their formation from two unique late-stage plutons, as well as the anorogenic nature and high degree of fractionation of the melts. This led to enrichments in F and high field-strength-elements (HFSE). The presence of F allowed for the development of fluoride complexes that sequestered HREE, and to a lesser extent LREE and HFSE, in the melt until the final stages of pegmatite crystallization when rare, incompatible element-enriched minerals crystallized. Lastly, local hydrothermal

and metasomatic activity in miarolitic cavities led to secondary alteration and the formation of a suite of replacement minerals.

Figure 1. Pink microcline crystals coated with white albite. Late-stage zircons are present on the microcline faces. FOV=18 cm.

Figure 2. Golden-brown ilmenite with bastnäsite-(Ce) and columbite-(Fe). FOV = 3 mm.