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Chemical variation and significance of micas from the Fregeneda-Almendra pegmatitic field (Central-Iberian Zone, Spain and Portugal)

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Abstract

Field, textural, paragenetic, and chemical data for micas from pegmatites of the Fregeneda-Almendra pegmatitic field (Central-Iberian Zone) are used to characterize and evaluate their petrogenesis. These pegmatites show a zonal distribution from barren to evolved, with an increase in degree of evolution with increasing distance from the Mêda-Penedono-Lumbrales leucogranite. Five types of evolved pegmatites have been recognized: (1) petalite-rich, (2) spodumene-rich, (3) Li-mica + spodumene-rich, (4) Li-mica-rich, and (5) cassiterite-rich pegmatites, plus six types of barren and intermediate pegmatites. Representative micas from the different pegmatite types and from the leucogranite were analyzed for major and trace elements. All micas belong to the muscovite-*lepidolite* series. Lithium is incorporated into Li-micas via the $Li_3Al_{-1}\square_{-2}$ and Si_2LiAl_{-3} substitutions, where $\square$ represents vacancies. The $Al_4Si_{-3}\square_{-1}$ and $Al_2\square_1R^{2+}_{-3}$ substitutions, where R^{2+} = (Fe + Mg + Mn), account for the compositional variability of micas from the Li-mica-free pegmatites. The Li, Rb, Cs, Be, Ta, and Nb contents of micas increase in the order: leucogranites and barren pegmatites < intermediate pegmatites < spodumene-bearing and petalite-bearing dikes < Li-mica-bearing pegmatites. The Ba content decreases in the same order, and Sn and Zn are relatively abundant in the intermediate pegmatites. These variations are consistent with rare-element enrichment via fractionation processes combined with partitioning of rare elements from the pegmatite melt into the minerals and volatile phases. However, some pegmatite types occurring in this area, such as the cassiterite-rich dikes, do not seem to form part of the same evolutionary trend.

Keywords: Micas, pegmatites, compositional variations, petrologic implications, degree of evolution, Fregeneda-Almendra area