

Mineralogical Characterization and Rare Earth Elements Potential in the Pegmatites of Adam Mine (Ancash, Peru)

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The Adam mine is located 20 km southeast of Casma, in the Ancash Department (northern Peru). Geomorphologically, it is located in the central segment of the Coastal batholith, called the Santa Rosa Superunit, which hosts a pegmatite complex. These rocks present petrographic variations ranging from tonalite to granite, where granodiorite is the predominant rock. The aim of this work is to characterize the mineral deposit in order to determine its genesis, mineralization, classification, and rare earth element potential.

As a result of this work, the mineralogy of the pegmatite lens was successfully determined. It consists mainly of milky and smoky quartz, K-feldspar, allanite (sorosilicate, epidote group), plagioclase, and micas. Most of these present crystallized textures. Additionally, there is a thin supergene blanket of malachite, hematite, goethite, and minor cuprite.

The genesis of the deposit corresponds primarily to magmatic activity, which allows the emplacement of the Coastal batholith in the Cretaceous age, where pegmatites were formed with rare earth minerals, mainly allanite ((Ca, Ce, Th, Y)₂(Al, Fe, Mn, Mg)₃(SiO₄)₃OH). These pegmatites are reported as lenses and veins with northeast trend. Subsequently, the continuous uplift and erosion allowed outcropping of the complex pegmatites, exposing them to the surface, generating a supergene profile of Fe and Cu minerals. According to the mineralogical and geochemical characteristics, the mine is considered a pegmatite deposit, allanite-monazite subtype with a geochemical signature of LREE, U, and Th. Nonetheless, if we consider the classification type-NYF, the deposit is an allanite subtype from the metaluminous group.

Regarding the potential of rare earth elements, allanite has 13.7% of LREE, on average, and, according to a spectrographic analysis, shows 3.2% Th and 0.005% U. The percentage of allanite is 1% in the lens and up to 10% in the veins, making it an area of interest for further studies.