

Compositional Features of Lithium-Bearing Pegmatites of the Sinsikourou and Kola Areas Around the Bougouni Region, Southwestern Mali

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The resurgence of global demand for rare metals—notably lithium, which is essential in energy transition—has stimulated renewed interest in exploring economically viable deposits. This study focuses on the Paleoproterozoic pegmatites located in the Sinsikourou and Kola areas of the Bougouni region, southwestern Mali. Selected pegmatite samples from the study areas were prepared for petrographic investigation; whole-rock pegmatite analysis using the inductively coupled plasma-optical spectrometer (ICP-OES) and inductively coupled plasma-mass spectrometer (ICP-MS) was also undertaken. Petrographic studies reveal quartz, plagioclase, microcline, muscovite, and spodumene as major mineral constituents, while garnet, apatite, and tourmalines occur as accessory minerals. Geochemical analysis reveals a high silica value ($\text{SiO}_2 = 72.3\text{-}80.91$ wt.%) in the whole-rock pegmatite, while low compositions were observed for the other oxides. Lithium shows significant enrichment values ranging from 3,400 ppm to >10,000 ppm and low to moderate enrichment ranging from 19 ppm to 871 ppm, revealing both lithium-enriched and barren pegmatites in the investigated areas. Additionally, rare earth elements such as Cs (11-203 ppm); Ta (2-149 ppm); Nb (9.4-90.8 ppm); Sn (50.8-561 ppm); and Be (52-668 ppm) are fairly enriched. Depletion patterns in rare metals are evident, as illustrated by Ta vs. Nb and Ta vs. K/Cs indices. Overall, these findings suggest the viability of the Paleoproterozoic pegmatites in the Sinsikourou and Kola areas as sources of rare metals, particularly lithium. Further exploration and analysis may be warranted to assess the economic feasibility of exploiting these deposits.