Acquisition and Processing of Geophysical Data for Identification of Potential Accumulation Zones of Light Rare Earth Elements in Ionic Clay in Southern Bahia

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Abstract

This study aimed to use gamma spectrometry and electrical resistivity techniques to map potential accumulation zones of light rare earth elements (LREE) in ionic clay in the southern region of Bahia, specifically in the municipality of Itamaraju. The geological context involves the Araçuaí Belt formed during the Brasiliano Orogeny. It is mainly composed of kinzigites gneisses from the Jequitinhonha Complex, granites, and metasyenites forming a landscape with many elevations and depressions that create areas of sedimentary cover.

Initially, geophysical data acquisition campaigns were conducted in the study area. The gamma spectrometry technique was used to identify in the map of gamma radiation anomalies, indicating the presence of radioactive minerals associated with LREE. Additionally, the electrical resistivity method was employed to map subsurface characteristics, aiming to identify geological structures favorable for LREE accumulation.

Based on the obtained results, it was possible to delineate four potential targets for prospecting. These targets were ranked in order of potentiality, considering the information derived from the applied geophysical techniques. This initial classification allowed for a more efficient direction of field activities. Subsequently, rotary drilling of 20 meters depth was carried out in each of the four delineated targets. These drillings were essential to obtain representative subsurface samples, enabling geochemical analysis of LREE contents present in the ionic clays.

The results of the geochemical analysis confirmed the potential of the studied area for LREE accumulation in ionic clay. Significant contents of these elements were observed in all four prospecting targets, with target 1 being particularly noteworthy, reinforcing the region's importance for the exploration of these strategic resources.

Furthermore, the data obtained from the electrical resistivity method allowed for the in-depth mapping of the best locations for LREE accumulation occurrences. This information is crucial for planning future exploration and development activities of these resources.

In summary, this study demonstrated the effectiveness of combining gamma spectrometry and electrical resistivity techniques in identifying and mapping potential accumulation zones of light rare earth elements in ionic clay. The obtained results provide important support for the sustainable and efficient exploration of LREE.