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PLANAGEO-Methodology to conduct a geochemical survey for mineral exploration in SW Angola

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Abstract

A 7-year project (Plano Nacional de Geologia, PLANAGEO) was conducted in SW Angola, which involved geological mapping at 1:250.000 and 1:100.000 scales, airborne geophysics (magnetics, radiometrics), geochemistry at 1:250.000 scale and investigation on the potential for metallic and non-metallic minerals. The selection of regional potential areas for metallic mineral exploration was backed by the analysis of previous exploration reports, the Mineral Catalogue of Angola, other publications, as well as unpublished theses, that were compiled to create a comprehensive mineral database. The selected targets were: i) rare earth elements (REE) located in the southwestern end of the alkaline-carbonatitic structures related to the Volcanic Belt of Angola, namely Serra da Neve greenfield area, Tchivira-Bonga and Catanda brownfields; ii) the brownfield areas of the Archean terrains and granitic intrusions containing Au-Fe in Jamba-Cassinga-Tchamutete, Chipindo and Cuima-Samboto regions; iii) Cr-Ni and Cu and Nb-Ta-Li-Be in the ultramafic intrusions of Chibia-Humpata region and the granitic rocks and the Giraúl pegmatites, respectively, in the Namibe region. Planning the field campaign was a challenging task due to the diverse terrains in an area over 476,000 km², ranging from desert areas near the coast to the Angolan Plateau. The time for the field work was very tight and it was divided into two campaigns during the dry seasons. The implemented sampling plan needed to consider the sampling sites within a reasonable distance to the rarely available roads and the tracks covered during the geological mapping. The morphoclimatic conditions guided the field program, e.g.in certain areas, such as, the Plateau during the rainy season where the poor drainage led to flooding and saturation of the land. As a result, sampling stream sediments often becomes impractical because it was difficult to define water flow lines and understand the origin of any anomalies. Sampling in non-perennial streams near the desert should not occur in watercourses with sediment that is markedly lighter than the surrounding rock due to the action of aeolian transport and deposition of desert sand. Instead, it is chosen watercourses sediment that reflects the decomposition of the rock. Clearly the usual criteria of low stream order is not applicable in this case, but rather the colour of the sediment should be considered. This is because even the first-order watercourses on the desert border can contain desert sands. Soil sampling in the desert

boundary is frequently impossible because it is almost absent. Regions such as the Serra da Neve alkaline complex rocks were used to represent the distribution of chemical elements, and in the surrounding area of the complex, stream sediments were considered the best option.

Under these circumstances and considering the wide area where the target raw materials occurred, it was decided to collect different sampling media according to the region and type of existing surface material to highlight the geochemical signal and ensure a clear contrast between background and anomalous values of chemical elements. In summary, multimedia sampling was more efficient but, interpretation needs to be somewhat cautious.

Keyword

Mineral potential, geochemical signal, sampling, geochemistry