

### **Integration of Petrographic, Structural, and Geochemical Data in Weathered and Challenging Prospective Areas: Case Study of the Descoberto Prospect, Brazil**

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The Iron Quadrangle (IQ) is a world-renowned mineral district with a complex tectonic and structural history. Located in the São Francisco Craton in Minas Gerais, Brazil, the IQ is related to historical gold extraction in the country since the 18th-century, during the Portuguese colonization. In this context, scientific studies of gold prospects and responsible mining are encouraged. This study focuses on a better understanding of petrography and the structural architecture that hosts the mineralization at the deposit scale. The area is within the geological context of the metavolcanosedimentary sequence of the Archean Rio das Velhas greenstone belt, with the mineralization hosted in quartz veins. The Descoberto prospect is intensely weathered and located in a dense vegetation cover area, presenting a scarcity of outcrops, and well-developed soils due to the tropical climate. Thus, the integration of petrographic, structural and geochemical data with field mapping greatly assists in geological understanding at local and regional scales. Soil sample data were analyzed and diamond drillhole samples were selected for thin sections covering all the lithotypes in the area. The recent interpretation suggests that the prospect is not located within the north flank of a recumbent fold, as thought, but in a NWW-SEE shear zone. The existence of NEE-SWW diabase dyke cutting the structure is also new evidence and it's marked by high concentrations of Nb-Ta-Ti immobile elements in soil chemical analysis. Petrographic data of a Nb-Ta-Ti-rich drillhole intercept and partition coefficients for minerals such as titanite and ilmenite, in basaltic to andesitic magmas, support the dyke interpretation. The study underscores the value of well-collected and reliable data, as well as the importance of periodically reevaluating such data in light of new reinterpretation opportunities. It also highlights the potential of tools such as geochemistry to improve geological understanding in highly weathered and challenging prospective areas.