Overview of the phosphate deposits at Morro Verde Mine (Pratápolis, MG) Southern Brasília Belt: Structural Controls and Implications.

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The Morro Verde Mine, located in Pratápolis, Minas Gerais, is engaged in the extraction of critical phosphate minerals and produces phosphate fertilizers for global food production. The mine forms part of the Morro Verde Unit, a metasedimentary sequence tectonically enclosed within the Archean-Paleoproterozoic basement of the São Francisco Craton, and tectonically covered by the Passos Nappe. The phosphate-rich rocks distribution within the Morro Verde Mine displays a complex deformation history, investigated in this study. Field work involved describing macrostructural features of cross-sections along the mine benches and collecting orientation measurements of deformational structures. The mine's lithology includes phyllites, limestones, phosphate siltstone, and silexite. The data suggest that multiple NW-SE fault zones influenced phosphate mineralization, resulting in thick cataclasite bands classified as fault zones. These fault zones are consistently bordered by slickenside planes. Hydrothermal fluids percolated within these faults, leading to widespread metasomatism, involving silicification and P_2O_5 enrichment. Metasomatism raises the hardness of cataclasites and associated limestones, both of which are targeted and extracted during mining operations. The substantial variability in P_2O_5 content, ranging from 3% to 36% in the cataclasites is associated with the proportion of phosphate-bearing rock involved in their formation. Furthermore, it indicates that metasomatism results in the silicification and phosphate enrichment of the lithologies. Our findings provide insight into the intricate interplay between tectonic and hydrothermal processes in the region.