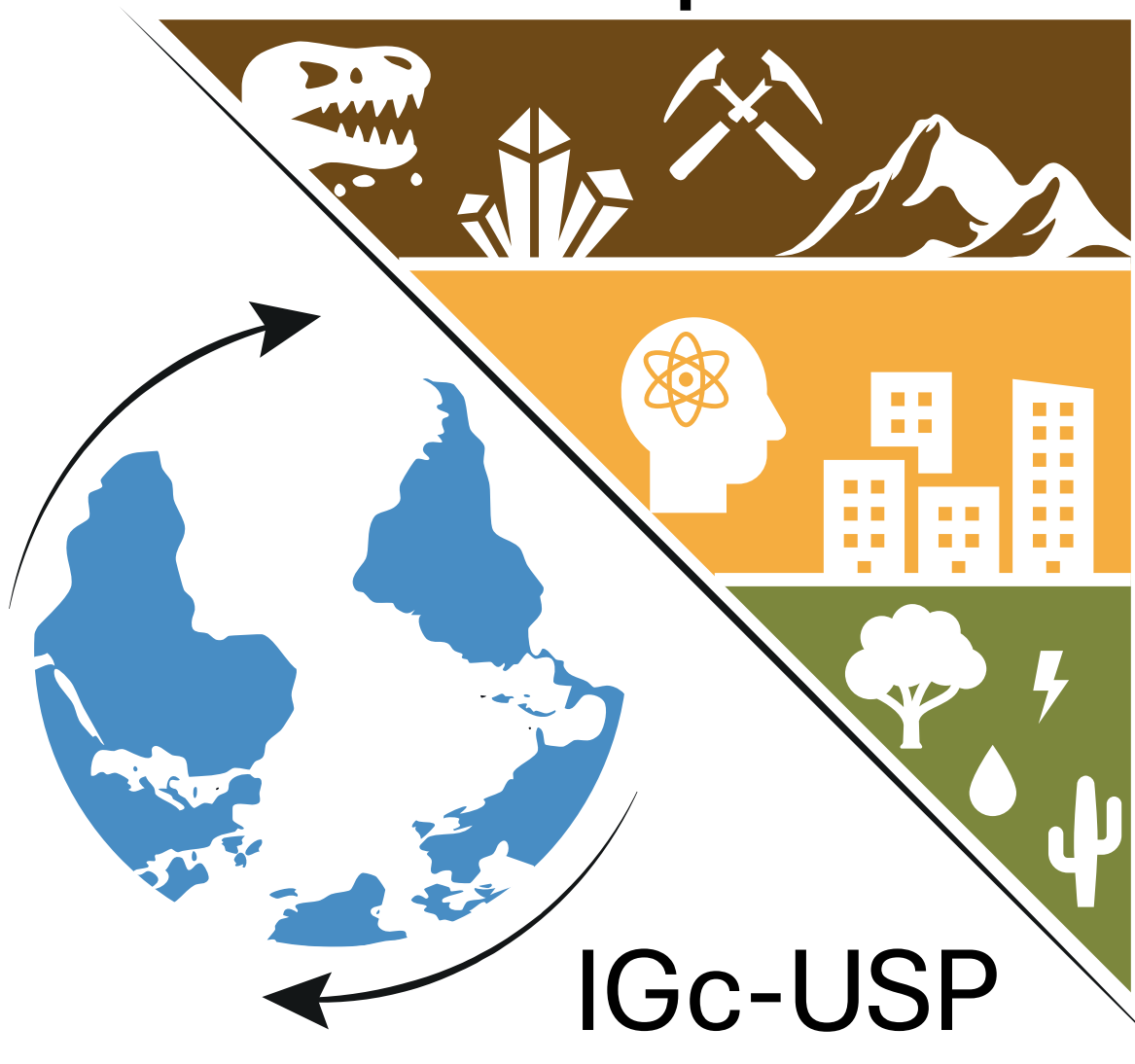


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HYDROTHERMAL PROCESSES AND MINERALIZATION AT THE NEOARCHEAN AQW7 REDUCED CU-SKARN, CARAJÁS MINERAL PROVINCE

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RESUMO: This study presents the first titanite age determination for the AQW7 Cu-skarn deposit, located in the western part of the Carajás Mineral Province. Copper mineralization, dominated by chalcopyrite-(pyrrhotite), occurs near the contact between a gabbro body from the Cateté Intrusive Suite and siliciclastic units of the Neoproterozoic Itacaiúnas Supergroup. The gabbro displays sub-ophitic texture, locally with granophyric texture, indicating shallow emplacement. The prograde paragenesis, formed under reducing conditions in both endoskarn and exoskarn, comprises graphite, marialite, and diopside with apatite, albite, quartz, and titanite. In the retrograde stage, hornblende was followed by actinolite–quartz; chamosite and tourmaline selectively overprint earlier metasomatic assemblages. Sericite precedes late marialite, calcite, clinozoisite, and quartz associated with pyrrhotite and chalcopyrite. Petrography, Raman spectroscopy, TIMA mineral mapping, and in situ U–Pb–trace element analyses of titanite (LA-ICP-MS) were conducted. Raman data identified two-phase (liquid–vapor) primary methane-bearing fluid inclusions in diopside and indicated graphite crystallization temperatures of ~724 °C. Titanite occurs in both exoskarn and endoskarn as pale brown to brown euhedral–subhedral crystals, showing accretive growth around early euhedral cores. Trace element signatures suggest fluid–rock interaction with redox changes during skarn hydrothermal evolution, under relatively stable temperature and pressure. The Al-in-titanite barometer yielded pressures of ~0.20 GPa, and Zr-in-titanite thermometry gave temperatures of ~692 °C, consistent with graphite temperature estimates. In the endoskarn, chondrite-normalized REE patterns in titanite show an upward concave shape with a strong negative Eu anomaly ($\text{Eu}/\text{Eu}^* = 0.39$), possibly due to Eu retention by apatite. Ce/Ce^* ratios < 1 and high Th/U ratios indicate reducing conditions, consistent with graphite presence and methane-rich fluid inclusions. In contrast, in the exoskarn, Ce/Ce^* ratios > 1 and lower Th/U ratios reflect more oxidizing conditions. These patterns, coupled with high REE concentrations, may reflect prolonged fluid–rock interaction with the sedimentary host rocks, resulting in the effective leaching of elements. Titanite U–Pb data indicate a minimum skarn mineralization age of ~2.58 Ga, representing an important metallogenic event recorded in IOCG deposits of the Northern Copper Belt in the Carajás Mineral Province. The AQW7 skarn deposit may be part of the regional IOCG mineral system, emphasizing the significant role of Neoproterozoic mafic intrusions in copper enrichment in the province.

PALAVRAS-CHAVE: FLUID-ROCK INTERACTION, IN SITU TITANITE AGE, HUB AQUIRI, GRAPHITE CRYSTALLIZATION TEMPERATURES



Este trabalho foi destaque na Sessão Temática 4 - Aplicação e Inovação em Geociências, modalidade apresentação oral