Microinclusion Geochemistry in White Micas from Porphyry Deposits and Transitional Environments: A Case Study from Globe-Miami Copper District, USA

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White micas are key alteration minerals commonly associated with phyllic alteration zones and also play an important role in the sericite-chlorite zone of porphyry systems. In economic geology, particularly in porphyry deposit exploration, the term “white mica” typically refers to minerals within the phengite solid-solution series, with compositions ranging between the end members muscovite (K[Al2][AlSi3]O10[OH]2), Mg-celadonite (K[Mg2][Si4]O10[OH]2), and Fe-celadonite (K[Fe2][Si4]O10[OH]2).

Efforts have been conducted to understand white mica as a vectoring tool for mineralization in porphyry environments, focusing on metal zonation patterns associated with pH gradients of mineralizing fluids and distinguishing different phyllic alteration events. However, the mineralization footprint recorded by white mica, along with the potential influence of mineral microinclusions on its chemical composition and implications for exploration, remains poorly understood.

In this work, we present new LA-ICP-MS data from white mica related to the Ocelot porphyry copper deposit, Globe-Miami district, Arizona, USA, we aim to understand the influence of mineralizing hydrothermal fluids with the occurrence of diverse microinclusion phases locked within white mica. For this purpose, white mica from different host-rocks, alteration styles and distance to mineralization were sampled and analyzed.

Preliminary results revealed variations in white mica chemistry with a contrast between primary magmatic muscovite from host-rocks and hydrothermal phengitic and illitic white micas related to phyllic and intermediate argillic alteration. A high abundance of mineral microinclusions (zircon, rutile, Cu-Fe sulphides, and REE bearing phosphates including apatite and monazites) was detected in white micas proximal to areas with high Cu and Au contents demonstrating a potential link between these microinclusions and white mica associated mineralization in the Ocelot deposit.