

Integrated Re-Os, Ar/Ar, and U-Pb Geochronology Directly Dates the Timing of Mineralization at the Mina Justa and Marcona Deposits, Peru

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Iron oxide-copper-gold (IOCG) and iron oxide-apatite (IOA) deposits are major sources of Cu and Fe, respectively. They contain abundant Fe-oxides and may contain Au, Ag, Co, rare earth elements (REEs), U, Ni, and V as economically important by-products. In Peru, the Mina Justa IOCG deposit is located next to the giant Marcona IOA deposit. Constraining the timing of Fe and Cu mineralization at Mina Justa is fundamental to understanding the duration and type of processes that generated this mineral deposit, and ultimately to testing the genetic link with other deposits in the area. Previous authors used alteration minerals to indirectly date Cu mineralization at Mina Justa at around 100 Ma. We report Ar/Ar dates of actinolite, U-Pb dates of magnetite, apatite, and titanite collected by in situ laser ablation-multicollector-inductively coupled plasma-mass spectrometry, and Re-Os thermal-ionization dates of sulfides. Our results indicate that Cu mineralization at Mina Justa occurred at about 160 Ma and that Fe mineralization is older and coeval with the neighboring Marcona IOA deposit, consistent with Cu mineralization overprinting IOA-style mineralization at Mina Justa. This work also provides a new framework for exploration for these deposits in Peru.