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Trace Elements and U-Pb Dating of Zircon from the Humpa Leu East Porphyry Cu-Au Prospect, Sumbawa Island, Indonesia: Implications for Petrogenesis and Magma Fertility

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The Humpa Leu East (HLE) porphyry Cu-Au prospect is located in the eastern part of the Sunda metallogenic belt, Sumbawa Island, Indonesia. The belt hosts many world-class porphyry Cu-Au deposits formed around 5.7-0.5 Ma, including Tujuh Bukit, Batu Hijau, Elang, and Onto-Hu'u. As the eastern Sunda arc is geologically young and still developing, it is difficult to find mineralization cropping out at the surface. Therefore, more advanced and cost-effective geochemical techniques are required to reduce costs and time in exploration. This study focused on the trace elements of zircon in porphyritic intrusive rocks to understand the petrogenesis and determine the magma fertility based on LA-ICP-MS analysis. This can be potentially applied in discovering new porphyry prospects in the eastern Sunda arc. The HLE zircon has a slightly high U/Yb > 0.1 with low Ti content < 20 ppm indicate that the intrusive rocks related to the mineralization in the HLE are a product of continental crust/active continental margin, reflecting the subduction of the Indian oceanic plate beneath the Sunda continental plate. Moderate pyramid and prismatic zircon shapes indicate that the HLE zircon is a product of calc-alkaline magmas and 650-800 °C crystallization temperature, respectively. Ti-in-zircon thermometry shows similar result ranging from 737 to 883 °C (av. 779 °C). Furthermore, U-Pb dating of zircon on the HLE yielded dates of 1.2 to 1.0 Ma. In this study, we observed that zircon in the intrusive rocks related to the mineralization show significant oxidized (Eu/Eu* > 0.4 and Ce/Ce* > 50) and high water content conditions as evidence of amphibole fractionation (Yb/Dy > 5 and Y/Ho > 30). In parallel with many other previous studies, geochemistry of zircon from HLE porphyry-related intrusions suggested oxidized and high water content magma which is applicable for magma fertility assessment, especially for the eastern Sunda metallogenic belt.