Using apatite to discriminate ore-bearing and ore-barren adakitic rocks: A case study from the Edong region of the Middle and Lower Yangtze River metallogenic belt, South China

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Edong region is located in the westernmost part of the Middle and Lower Yangtze River metallogenic belt, where both ore-bearing and ore-barren adakitic rocks occur. To discriminate the difference between these two types of rocks, we carried out a detailed study on the quartz monzodiorite porphyry in the Tonglvshan Cu-Fe-Au deposit and in the Jiguanzui Cu-Au deposit and ore-barren adakitic rocks in the Yangxin pluton for their major, trace elements and Sr-Nd isotopes of bulk rocks, U-Pb dating of zircon, together with in situ EMPA and LA-ICP-MS major and trace elements analyses in apatite from these rocks.

The results show that these rocks are all adakitic in nature and they share similar intrusive ages and bulk rock compositions, but different apatite composition. The P_2O_5 content in apatite from the ore-bearing rock is 41.3-41.7%, whereas the content in ore-barren apatite is slightly higher (41.9-42.2%). The F content is higher in ore-barren apatite than the ore-bearing ones. The Mg content is also higher in ore-barren apatite than the ore-bearing ones at the same Fe content. The Ba content has a positive correlation with the Sr in ore-barren but remains constant in ore-bearing rocks. These data demonstrate that apatite is a potential indicative mineral that can be used for identifying ore-barren from ore-bearing adakitic rocks, which provide a fit-for-purpose exploration tool for mineral resource industry.