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## Chemical variations in hydrothermal systems recorded by epidote in altered oceanic crust of South China Sea

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The circulation of seawater within the oceanic crust promotes the extensive chemical variations of the lithosphere prior to its entering subduction zones as well as the development of the biosphere. A good understanding of the chemical variations during hydrothermal circulation is essential to further decipher the biological activities in such extreme environments. Epidote is a common byproduct, but a good indicator for hydrothermal activities during the hydrothermal alteration of oceanic crust.

This study presents the petrographic and geochemical features of epidote from depth of 850-910 m (below the surface) in the northern South China Sea margin to provide insights into the possible chemical variations in hydrothermal systems in subsurface. Eight samples with obvious epidote veins were chosen from the altered basalts in Hole 1502B of IODP Expedition 368. They cover a range with different depth and occurrences, including epidote veins, composite epidote-calcite veins, and composite epidote-silica veins. Sulfide mineralization is widespread and dominated with pyrite, chalcopyrite and sphalerite. Scanning Electron Microscopy images show that the epidote-calcite vein samples display obvious zonation structure in epidote, and the others not. The major element concentrations of Fe also show variations with epidote zonation. We further carried out in situ trace element concentration measurement on epidote minerals by Laser Ablation-Induced Coupled Plasma-Mass Spectrometry. In Chondrite-normalized diagrams, all epidote mineral samples show flat patterns with significant positive Eu anomalies, which may relate to highly oxidized conditions maximising Eu<sup>3+</sup> incorporation. We therefore propose that the zonation of epidote may reflect the pulse of hydrothermal activities, one of which is likely to be associated with the precipitation of chalcopyrite and sphalerite.