Chemical zoning of zircons and allanites in peraluminous granite, Korea: Implication for their melt evolution during crystallization

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Zircon and allanite commonly found in granitic rocks are important accessory minerals for trace-element evolution of melt as well as geochronology. An electron microprobe study with analyses of BSE and CL image was conducted on allanite and zircon from peraluminous granite where allanite, zircon, apatite, titanite and ilmenite occur as accessory phases.

Textural observations of BSE images suggest that allanite crystallized incorporating early-crystallized apatite and zircon inclusion, and that the growth of zircon was closely related to allanite zoning. The zircon grains with typical oscillatory zoning are rimmed by the U-enriched overgrowth with low Th/U and Zr/Hf, but the U-Pb ages of the both domains give Triassic ages, ca. 219 Ma, indistinguishable within uncertainty. The euhedal to subhedral allanite, mantled by magmatic epidote, is characterized by oscillatory zoning and around partly altered (or metamictized) grains REE-carbonate (lanthanite or Bastnäsite?) veins are found. The bright domain in BSE images of allanite is more enriched in REE than the dark one. The REE contents and variation patterns may result from the fractionation of allanite from melt. However, the correlations between chemical composition and BSE image reveal that the coupled substitutions are distinct in the bright domains rather than in the dark ones. Thus, it is inferred that the chemical zoning of allanite and zircon can provide a clue for constraining the evolution of granitic melt along with isotopic ages.