Mantle-crust interaction recorded in zircons from Jeju trachytes

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Jeju Island, lying on the continental shelf off the south coast of the Korean Peninsula, is the emergent portion of an intraplate volcanic field developed over the last c. 1.8 Ma. Jeju magmas show typical OIB-like geochemical signatures, with whole-rock radiogenic isotope compositions apparently displaying the DMM-EM2 array. We collected zircons from two trachytes representing the Early Pleistocene high-Al alkali (Sanbangsan) and the Late Pleistocene low-Al alkali (Hallasan) suites. Zircons from the Sanbangsan trachyte yielded ID-TIMS $^{206}Pb/^{238}U$ ages between 0.84 and 0.77 Ma. The laser probe MC-ICP-MS data for zircons from the Hallasan trachyte defined a ^{238}U-^{230}Th disequilibrium age of 31 ± 6 ka. These ages are indistinguishable from Ar-Ar ages of the host trachytes, therefore indicating a short interval between zircon crystallization and volcanic eruption. The laser probe data reveal a wide Hf isotopic variation in the Sanbangsan (ε_{Hf} = +14.4 to +1.6) and Hallasan zircons (+12.0 to +4.0). Corresponding ion microprobe oxygen isotope analyses show that high-ε_{Hf} (> +10) zircon domains selectively retain the original mantle value ($\delta^{18}O_{SMOW}$ = c. 5.2‰). The negative and positive correlations of ε_{Hf} and $\delta^{18}O$ observed in the Sanbangsan and Hallasan zircons reflect separate assimilation trends of the DMM component by the weathered and hydrothermally-altered supracrustal rocks, respectively. Our microbeam data suggest that enriched mantle-like whole-rock radiogenic isotope compositions prevalent in Jeju volcanic rocks should be treated with caution.