

Hydrogen isotope analysis of apatite inclusions in the Hadean to early Archean zircon

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We measured hydrogen isotopic composition of apatite inclusions trapped in Hadean to early Archean igneous zircons from sedimentary rocks in Jack hills greenstone belt and tonalitic rocks in Acasta gneiss, Labrador gneiss, and Tanzawa tonalite in order to compare the isotopic ratio of ancient ocean with that of modern oceanic water.

Hydrogen isotope analysis with SIMS show the data sets with the range about $\delta D = -50$ to -340 from Jack Hills zircons (3.3 to 4.3 Ga), -15 to -265‰ from Acasta (3.5 to 4.0 Ga) and Labrador (3.8 to 3.9 Ga), and $-57 \pm 19\text{‰}$ from Tanzawa tonalite (4.5 Ma) samples. In addition, we evaluated the micro-cracks in zircon to exclude the negative possibility of secondary hydrogen interaction of apatite inclusions. Assuming the magma type the apatite crystalized, Arc-type apatite have the composition $\delta D = -106$ to -170‰ , and Mantle-type have $\delta D = -232 \pm 27\text{‰}$ and $-338 \pm 22\text{‰}$, respectively. The data set above-mentioned result in the Archaean ocean $\delta D = -84 \pm 19\text{‰}$ and mantle water $\delta D = -232 \pm 27\text{‰}$ and $-338 \pm 22\text{‰}$.

Keywords: Hadean-early Archean, zircon, apatite, hydrogen isotope analysis