Common-Lead corrected Uranium-lead Age Dating of Perovskite by LA–SF–ICP–MS

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We investigated the benefits (very high sensitivity, flat peak tops, large linear dynamic range) of single collector magnetic sectorfield ICP-MS (SF-ICP-MS) for U-Pb dating of perovskite by laser ablation. Perovskites from kimberlites from Garnet Lake, W Greenland, and Pyramidefjeld, SW Greenland, have been separated. Multigrain aliquots of both perovskite separates were dated by ID-TIMS, yielding emplacement ages of 568±11 Ma for the Garnet Lake kimberlite [1] and 151±2 Ma for the Pyramidefjeld kimberlite [2]. Multiple perovskite grains from both samples have been dated in-situ employing 30 μm diameter single spot analyses by laser ablation employing a ThermoFinnigan Element2 SF-ICP-MS coupled to a NewWave UP 213 laser system. A common lead correction was applied based on the measured ^{204}Pb intensity (after correction for the measured ^{204}(Pb+Hg) gas blank). Perovskite from the Ice River Complex, British Columbia, was used as a secondary standard for quality control purposes. Multiple in-situ measurements of the Ice River perovskite yielded concordia ages of 359±3 Ma that are in excellent agreement with the age of 361.7±1.0 determined by ID-TIMS [3]. Nineteen in-situ analyses of perovskite grains extracted from the Garnet Lake kimberlite yielded a concordia age of 566±5 Ma, also in excellent agreement with the age obtained by ID-TIMS. Because of the very low Pb contents in perovskites from the Pyramidefjeld (around 1 ppm) and the associated large uncertainties of the common lead correction, no concordia age could be obtained. However, the in-situ laser ablation analysis yielded a common lead corrected weighted average ^{206}Pb/^{238}U age of 152±3 Ma which is in excellent agreement with the weighted average ^{206}Pb/^{238}U age obtained by ID-TIMS. Our results demonstrate that laser ablation SF-ICP-MS is a fast and inexpensive method for precise and accurate common lead corrected U-Pb age dating of perovskite.

[1] Hutchinson & Heaman (2008) *CanMin* **46**, 1063-1078. [2] Heaman *pers.comm.* [3] Tappe & Simonetti (2012) *ChemGeol* **304-305**, 10-17