U-Pb, trace element, and hafnium isotope composition of the Maniitsoq zircon: A potential new Archean zircon reference material

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The U-Pb, trace element, and Hf isotope composition of zircon megacrysts from a late magmatic vein related to Mesoarchean gabbronorite from the Maniitsoq region of West Greenland have been extensively characterized by LA-ICPMS and TIMS analysis. The crystals are typically euhedral, 1-5 mm in diameter, and exhibit heterogeneous internal zoning, cut locally by thin, CL-bright veinlets. Chemical abrasion ID-TIMS U-Pb analysis of three fragments yield uniform, concordant results and a $^{207}Pb/^{206}Pb$ weighted average age of 3008.70 ± 0.72 Ma (MSWD = 0.9). LASS-MC-ICPMS U-Pb analyses, normalized to OGC zircon, exhibit slight normal discordance, with <2% discordant spots yielding an identical $^{207}Pb/^{206}Pb$ weighted average age of 3008.8 ± 2.2 Ma (n = 94; MSWD = 0.36). Uranium and Th concentrations average 141 ± 39 and 154 ± 77 ppm, respectively, with Th/U = 1.07. REE compositions are relatively uniform, with average total REE = 602 ± 186 ppm, positive Ce-anomaly (Ce/Ce* = 142) and negative Eu-anomaly (Eu/Eu* = 0.16), and moderate HREE enrichment (Yb/Gd = 5.6). Hf concentrations are moderate, averaging 10849 ± 630 ppm, with $^{176}Yb/^{177}Hf$ (0.015 ± 0.006) and $^{176}Lu/^{177}Hf$ (0.0005 ± 0.0001), close to the average for natural zircon. In comparison with common zircon reference materials, $^{176}Yb/^{177}Hf$ and $^{176}Lu/^{177}Hf$ are similar to that of Temora2, and greater than Mud Tank, 91500, and Plesovice zircon, making Maniitsoq well-suited for verifying the $^{176}Yb+Lu$ interference correction on $^{176}Hf/^{177}Hf$. The average interference-corrected $^{176}Hf/^{177}Hf$ value determined by LASS-MC-ICPMS is 0.280862 ± 21, with an age-corrected $^{176}Hf/^{177}Hf_i$ value of 0.280833 ± 20, corresponding to a slightly negative average εHf value of -0.38 ± 0.70. The large crystal size, abundance, and largely homogeneous chemical and isotopic composition of the Maniitsoq zircon makes it a useful reference material for verifying the accuracy of U-Pb, trace element, and Hf isotope analyses by LA-ICPMS. Further characterization is in progress, and crystals will be distributed by the first author upon request.