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Hf-W ages and REE systematics of eucrite zircon

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The short-lived ^{182}Hf-^{182}W chronometer and REE systematics of igneous zircon grains from basaltic eucrites were used to constrain their formation conditions and the duration of magmatism on the eucrite parent body, possibly 4 Vesta. Samples were investigated using electron microscopy and the Cameca 1280 ion microprobe. Zircon grains within a eucrite sample have variable REE pattern and W isotope ratios, indicating distinct growth episodes ranging from 4555.4±0.7 Ma to 4523 (+6/-12) Ma. These observations indicate the generation of basaltic melts for at least 45 Myr after CAI, twice as long as previously thought (e.g., [1,2]), and in agreement with thermal models (e.g., [3,4]). Thus, zircon crystallized when ^{26}Al was ineffective as a heat source, which requires that early formed magma(s) survived sufficiently long inside the parent body. A well-insulating crust may have preserved internally generated heat that sustained prolonged magmatism. The ultimate source of the heat must have been the decay of mostly ^{26}Al, which in turn required accretion within the first ~4 Ma of the Solar System.

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