SEARCH FOR EXTINCT ^{60}FE IN SECONDARY PHASES IN POLYMICT EUCRITES

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HED meteorites are the most abundant achondrites collected on Earth. Eucrites are basaltic and gabbroic rocks formed as lava flows or dykes and are thus perceived as upper crust samples of their parent body. Diogenites are mostly orthopyroxene cumulates, sometimes harzburgites or dunites, and are believed to be plutonic rocks. Howardites show a mixture of both previous lithologies. The parent body of the HED is widely considered to be the asteroid Vesta as supported by the Dawn mission spectroscopic data [1].

Eucrites show evidences of complex shock and metamorphic events stated by their wide-ranged textures and chemical composition. They are mostly brecciated. Numerous eucrites show evidence of secondary alteration related to a fluid agent. This secondary alteration is improbably a result of shock but likely the result of metasomatism by a vapor phase [2]. Many pure Fe-metal grains were also found in eucrite NWA 5738 and have been interpreted as deposits from a fluid sourced from a volatile-rich impactor such as carbonaceous chondrite [3].

Many studies were conducted on meteorites searching for evidences for live ^{60}Fe [4]. ^{26}Al is safely considered as heat source for early planetary melting and differentiation, whereas the importance of ^{60}Fe is more controversial. Our study on some polymict eucrites shows that those rocks contain pure Fe- metal with Ni below the EPMA detection limit. The Fe-metal veins are blade-shaped and cross through silicate minerals. Using NanoSIMS, we are looking for evidence for live ^{60}Fe in those pure Fe grains. This will bring clues on the timing of the formation of the grain, their possible tie to primary differentiation processes in Vesta, and possibly the original abundance of ^{60}Fe at its formation.

References: [1] Harry Y. McSween Jr. et al 2013. M&PS 48, Nr 11, 2090–2104 [2] Barrat J. A et al. 2011. GCA 75, 3839–3852. [3] Paul H. Warren et al. 2014. GCA 141 (2014) 199–227 [4] S. Mostefaoui et al. 2004. New Astronomy Reviews 48 (2004) 155–159.