Pb and Rb-Sr isotope systematics of enriched components in Tissint

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Leachates of depleted shergottite Tissint are relatively enriched in radiogenic Sr and Pb isotopic compositions compared to igneous minerals [1,2]. It has been hypothesized that the sources of enrichment are martian soils [3,4], but this is debated [5]. Additional hypotheses include addition of Pb isotopes by fluids [6] and, or impact metamorphism [7]. The host of these radiogenic components remains unclear.

Multiple specimens of Tissint were analyzed both in-situ in thick section (TS2) via LA-ICPMS at the University of Houston and whole rock via TIMS at the University of Wisconsin-Madison. In-situ analysis included REE, highly siderophile element (HSE) concentrations and Pb isotopic compositions. Eight individual specimens of Tissint were analyzed for ^{87}Rb-^{87}Sr via TIMS and consisted of 7 solid fragments, and a fine-grained powder aliquot from another individual fragment.

Analyses of Tissint did not reveal the presence of exogeneous materials as previously hypothesized [3,4]. REE and HSE concentrations and Pb isotopic compositions confirm that the enriched components are not hosted in mineral phases or impact glass. ^{87}Rb-^{87}Sr analyses of leachates indicate that labile components hosting soluble Rb and Sr are not in isotopic equilibrium with the igneous assemblage. The Sr isotopic compositions of the leachate are within the range of 'more enriched' depleted shergottites, perhaps indicating sources from the igneous pile on Mars. Tissint is launch paired with at least 15 other olivine-phyric depleted shergottites. In theory, this enriched component could represent mineral coatings from highly volatile elements that were released from nearby depleted shergottite rock units during the impact ejection.

References: [1] Brennecka et al. (2014) Meteoritics & Planet. Sci., 49, 412–418. [2] Moriwaki et al. (2018) EPSL, 474, 180–189 [3] Chennaoui Aoudjehane H. et al. (2012) Science, 338, 785–788. [4] Rao et al. (2018) MAPS, 53, 2558- 2582. [5] Barrat et al. (2014) GCA, 125, 23–33. [6] Bellucci et al. (2016) EPSL,433, 241-248 [7] Basu Sarbadhikari et al. (2016) Meteoritics & Planet. Sci., 51, 1588-1610.