Ar-Ar AND Rb-Sr AGES OF THE TISSINT OLIVINE–PHYRIC MARTIAN SHERGOTTITE.

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Introduction: The fifth martian meteorite fall, Tissint, is an olivine-phyric shergottite that contains olivine macrocrysts (~1.5 mm) [1]. [2] reported the Sm-Nd age of Tissint as 596±23 Ma along with Rb-Sr data that defined no isochron. [3] reported Lu-Hf and Sm-Nd ages of 583±86 Ma and 616±67 Ma, respectively. The cosmic-ray exposure ages of Tissint are 1.10±0.15 Ma based on ^{10}Be [4], and 1.0-1.1 Ma, based on ^{3}He, ^{21}Ne, and ^{38}Ar [5,6].We report Ar-Ar ages and Rb-Sr data

Samples and Experimental methods: Sample Tissint-1 (1005 µg) consisted of fine-grained groundmass comprising mostly pyroxene and maskelynite; sample Tissint-Oli-2 (1360 µg) consisted of one big olivine macrocryst (~1 mm in diameter). We also separated maskelynite grains which were divided into four samples, each with a mass of ~30 µg. The isotopes ^{36,37,38,39,40}Ar were measured with a MAP 215-50 mass spectrometer [7]. Rb-Sr analysis was performed on Finnigan-MAT 261 and 262 mass spectrometers [8].

Results & Discussion: The preliminary ^{40}Ar/^{39}Ar plateau and conventional isochron ages of Tissint-1 are 707±29 (1-σ) Ma and 610±33 Ma, respectively. The Ar/Ar, Sm-Nd, and Lu-Hf ages [2,3] are just consistent at the 2-σ level. The preliminary ^{40}Ar/^{39}Ar plateau age of Tissint-Oli-2 is ~3 Ga. The high apparent age suggests the presence of excess ^{40}Ar derived, possibly, from trapped melt inclusions with K_2O ~0.02-0.54 [9]. It seems more likely, however, that the olivine macrocryst preserved ^{40}Ar inherited from the mantle in spite of later shock/heating.

Fifteen analyses of bulk samples and separated minerals showed the Rb-Sr system likely to have been disturbed by internal redistribution of Rb, and possibly affected by external disturbances [10]. Nonetheless, six samples - a whole rock residue after leaching, three maskelynite samples, and one each of the pyroxene, and olivine mineral separates - gave a well-defined isochron for an age of 621±17 Ma (n =6, MSWD=1.1). Some pyroxene and olivine mineral separates after leaching are displaced toward high Rb/Sr ratios relative to this isochron. The bulk rock leachate and one pyroxene separate are displaced towards low Rb/Sr and/or high ^{87}Sr/^{86}Sr ratios, the latter suggestive of external contamination. Maskelynite separates show no detectable disturbances, and define initial ^{87}Sr/^{86}Sr = 0.700746±7. This value is the lowest so far observed for a Martian meteorite.

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