PETROLOGY AND MINERALOGY OF THE TISSINT OLIVINE-PHYRIC SHERGOTTITE.

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Introduction: Tissint is a recent fall of Martian meteorites on July 18, 2011. It is a geochemically depleted olivine-phyric shergottite [1]. Here we report its petrology and mineralogy.

Petrology: Large euhedral to subeuhedral olivine magacrysts (mm sized) are set in fine-grained groundmass of olivine, pyroxene, plagioclase, and opaque phases. Pyroxene is the most abundant phase (53 vol.%), followed by olivine (12 % for megacrysts and 17 % for phenocrysts) and plgioclase (17 %). Both clinopyroxene and orthopyroxene are present. Olivine grain usually has a thin ferroan rim (15 μm). Plagioclase was converted to maskelynite by impact. Merrillite occurs as a minor phase. Shock-induced melt veins (100-200 μm in width) are visible in the section.

Mineralogy: The cores (Fo_{81}) of olivine megacrysts are more Mg-rich than those (Fo_{71}) of phenocrysts. Outer parts of olivine grains are relatively ferroan ($Fo_{55\text{-}60}$). Pyroxene also exhibits chemical zoning with Mg-rich core ($En_{59–68}Fs_{21–24}Wo_{8–19}$) surounded by Fe-rich rim ($Fs_{32–41}Wo_{12\text{-}16}$). Within a given grain, maskelynite is chemically homegeous. A compositional range of $Ab_{33\text{-}41}An_{58\text{-}66}$ was observed among different grains.

Discussion: The average analysis of the fusion crust was found to be essentially identical to the bulk composition of an olivine-phyric shergottite NWA 5789 [2]. The fusion crust of Tissint was then analyzed with an EMP using a defocused beam. It has a bulk Mg# [100×molar MgO/(MgO+FeO)] of 64. On the basis of the Mg-Fe partition coefficient (0.35) between olivine and melt [3], the cores of olivine megacrysts would have crystallized from a melt with an Mg# of 60.5. Therefore, Tissint does not represent a primitive, mantle-derived magma composition but contains a small amount (5 %) of excess olivine.

References: [1] Irving A. J. et al. 2012. Abstract #2510. 43rd Lunar & Planetary Science Conference. [2] Gross J. et al. 2011. *Meteoritics & Planetary Science* 46:116-133. [3] Filiberto J. and Dasgupta R. 2011. *Earth and Planetary Science Letter* 304:527-537.

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