Al Mala'ika (NWA 1669): A new Shergottite from Morocco: mineralogy and petrology

Conference or Workshop Item

AL MALA'IKA (NWA 1669): A NEW SHERGOTTITE FROM MOROCCO/MINERALOGY AND PETROLOGY. A. Jambon[1] , M. Bohn[2], O. Boudouma[1], H. Chennaoui-Aoudjehane[1,3], and I. Franchi[4], [1]Université P. et M. Curie, Paris 6, (France), [2]Université de Bretagne occidentale Brest, [3]Univ Casablanca, [4]Open University, Milton Keynes (UK).

Introduction: Al Mala'ika (NWA1669) a meteorite of 36g, found in 2001 has been recently identified as a shergottite. The single stone is covered with desert varnish with a few remnants of fusion crust.

It is a fine grained rock, with two closely intricated pyroxenes: pigeonite En_{58-25} Wo_{9-19} Fs_{32-61} and augite En_{47-19} Wo_{39-24} Fs_{54-18}. Their FeO/MnO ratio of 34 on the average, is typical for a shergottite. Their Mg# indicate that augite crystallized first. Plagioclase transformed to maskelynite (Ab_{41-53} Or_{1-6} An_{58-42}) is injected between pyroxene phenocrysts. Accessory minerals are: merrilite, Cl-apatite, pyrrhotite, ulvöspinel, ilmenite, silica and baddeleyite.

Impact melt pockets contain submicrometric stishovite needles. The rock is highly fractured at all scales : the cores of pyroxenes are crosscut by wide fractures while their margins are cut only by numerous small fractures. Maskelynite is marginally affected by few of the largest ones.

Secondary carbonate is present in some fractures. The major and trace element composition is under study.

Oxygen Isotopes: $\Delta^{17}O$= 0.30‰, $\delta^{17}O$= 2.85‰, $\delta^{18}O$= 4.91‰. These values are in agreement with the martian origin of this meteorite.

According to the experimental works, the compositions of pyroxenes indicate that augite crystallized first followed by the syncrystallisation of augite and pigeonite. According to the experimental work, this order of crystallization indicates a significant $P(H_2O)$, on the order of 0.2 Gpa, pointing out the significant abundance of water of the magma compared to the terrestrial basaltic equivalents.