The basaltic shergottite North West Africa 480 : petrology and geochemistry. J.A. Barrat[1], Ph. Gillet[2], V. Sautter[3], A. Jambon[4], M. Javoy[5], C. Göpel[5], M. Lesourd[6], F. Keller[7] and E. Petit[5], [1]CNRS UMR 6112 and Université d'Angers, 2 bd Lavoisier, 49045 Angers Cedex, France (barrat@univ-angers.fr).[2]Ecole Normale Supérieure de Lyon (CNRS UMR 5570) [3]MNHN (CNRS FR 32) Paris [4]Université Pierre et Marie Curie (CNRS UMR 7047) Paris. [5]Institut de Physique du Globe de Paris.[6]SCIAM, Université d'Angers.7UJF (CNRS UMR 5025), F-38400 Saint Martin d'Hères.

NWA480 is a small stone weighing 28 g, recovered last november from Sahara (Morocco). The main mass has been acquired by the Centre National d'Etudes Spatiales and is currently under study (consortium Théodore Monod). In this abstract, we present our results based upon petrographic observations, electron microprobe analyses, and chemistry of the rock.

Petrography: The stone is nearly totally covered with black fusion crust and consists mainly of large grey pyroxene cristals (the largest grains are up to 5 mm in length) and plagioclase converted to maskelynite. Excluding the melt pocket areas, modal analyses indicate the following mineral proportions : 72 vol% pyroxenes, 25 % maskelynite, 1 % phosphates (merrilite and Cl-apatite), 1 % opaque oxides (mainly ilmenite and chromite) and sulfides, and 1 % others such as silica and fayalite. Pyroxenes are subhedral to euhedral and display a very complex zoning. Their cores are Mg-rich (En77Fs20Wo3-En65Fs29Wo6), surrounded by Mg-rich augite (typically En41Fs29Wo30), and finally zoned toward a pigeonitic rim sometimes with a nearly Mg-free composition (En5Fs84Wo11). Maskelynites are interstitial to pyroxenes and typically lath-shaped. They are homogeneous (An46-50 Ab52-48 Or2) and no significant zoning was detected. Merrilite and apatite are present in NWA480. Merrilite occurs as rounded interstitial grains (the largest is up to 0.1 mm in length) often rimmed by a 6-40 micrometers thick mixture of fayalite, a silica rich phase, ilmenite, ulvöspinel and pyrrhotite, suggesting that the late stages of crystallization occured at an oxygen fugacity close to the FMQ buffer. Chromite crystals are found in the pyroxene cores. A mixture of dense silica glass and stishovite occurs mostly as irregular grains included in maskelynite or between maskelynite and pyroxene. Our observations, in agreement with the trace element distributions obtained on pyroxenes [1], suggest that NWA480 formed from a melt with a low nuclei density at a slow cooling rate. The texture was achieved via a single-stage cooling where pyroxenes grew continuously. A similar model was proposed previously for QUE94201 by [2].

Chemistry: The bulk composition of NWA480 has been determined using a combination of ICP-AES for major elements and ICP-MS for trace elements : TiO_2 1.16 wt%, Al_2O_3 6.46 wt%, FeO* 19.44 wt%, MnO 0.51 wt%, MgO 10.06 wt%, CaO 9.32 wt%, Na_2O 1.26 wt%, K_2O 0.10 wt%, Ni 63 ppm, La 1.48 ppm, Sm 1.73 ppm, Eu 0.76 ppm, Gd 2.67 ppm, Yb 1.33 ppm, Th 0.22 ppm. NWA480 is only marginaly weathered as indicated by the U, Ba and Sr abundances which are sensitive indicators of surface processes. Key element ratios such as FeO*/MnO (˜ 40), K/La (= 560) or Ga/Al (= 4.8 10^{-4}) indicate that NWA480 is a new member of the martian meteorites clan. In addition, NWA480 has $\delta^{18}O$ of +4.78 ‰ and $\delta^{17}O$ of +2.91 ‰. The corresponding $?^{17}O$ (=+0.42 ‰) is similar to the values obtained on other martian meteorites (e.g. [3]). The NWA480 REE pattern is similar to that of lherzolitic shergottite ALHA77005 [2]. We suspect that these shergottites shared a similar parent liquid, or at least the same mantle source. Isotope studies are now required to discuss the age of NWA480 and its possible petrogenetic link with lherzolitic shergottites.

References:

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