A NEW MARTIAN METEORITE FROM MOROCCO THE NAKHLITE NWA817. V.Sautter[1], J.A Barrat[2] Ph.Gillet[3], A. Jambon[4].J.P. Lorand[1], M Javoy[5] , J.L.Joron[6] and M. Lesourd[7]
1 Laboratoire de minéralogie, CNRS FR32, 61 rue Buffon, Muséum National d'Histoire Naturelle, 75005 Paris France (sautter@mnhn.fr) 2Laboratoire de Géodynamique et Planétologie, Université de Nantes, France; 3 Laboratoire de Sciences de la Terre, Ecole Normale Supérieure de Lyon, France; 4 Laboratoire MAGIE, Université Paris VI, Paris France; 5 Laboratoire de géochimie et cosmochimie IPGP, Paris France; 6 Laboratoire Pierre Sue, CEA-CNRS, Saclay, France7 SCIAM, 2 rue Haute de Reculée, F-49045 Angers, France.

NWA817 is a meteorite fragment of 104 g found in the Sahara (Morocco) by meteorite finder during one of his search campaigns in November 2000. The meteorite is an unbrecciated, medium grained olivine-bearing clinopyroxenite with a cumulate texture. (Fig.). Mineral modes (Vol%) are pyroxene 69%, olivine 15%, mesostasis 15% and Fe-Ti oxides 1%. It consists of zoned euhedral subcalcic augite (Wo38-40 En38-27 Fs24-34 and Fe/Mn = 39-31), olivine spanning a wide range of composition (from Fa 56 in the core to Fa 86 in the rim : Fe/Mn = 54-43) with recrystallized magmatic inclusions and a three components intercumulus mesostasis : zoned Fe-bearing feldspar (Ab67-47); Ti-magnetite (Usp39) with unusual skeletal growth morphologies containing ilmenite exsolution; acicular pigeonite(Wo15 En9 Fs76). Fe-Ti oxides equilibrated at T < 750°C and oxidation state near the FMQ synthetic buffer. Trace minerals are sulfides droplets and chlore-apatite. Pervasive alteration produced reddish clay minerals, a hydrous ferrous silicate both in olivine crystals and the mesostasis. The major element concentration of NWA817 are very similar to the other nakhlite: high FeO (= 19.84%), MgO and CaO concentration reflect the abundance of cumulus augite and olivine. Key element ratios such as FeO/MnO (37), Na/Al (0.40), K/La (449), Ga/Al (3.9 10^{-4}) and $\delta 18O$ (5,44) and $\delta 17O$ (3,2) with a corresponding $\Delta 17O$ of + 0.37 are clear evidence for a martian origin. The shape of incompatible trace element pattern (normalized to chondrite) showing a strong light REE enrichment is similar to that of Nakhla.

When compared to the other nakhlite (Nakhla, Lafayette and Governador Valadares), NWA817 displays however very specific features: a higher modal proportion of the mesostasis; quenched textures of Ti-magnetite and piegonite; olivine core composition more Mg rich whilst augite core composition is identical for all nakhlite; a more important Fe enrichment towards crystal rims in these cumulus minerals. The intercumulus minerals (Ti-magnetite with skeletal growth morphology, acicular chain of pigeonite and Fe^{3+}rich feldspar) evidence rapid crystallization of the mesostasis in response to high degree of supersaturation or undercooling at some stage of the sample story. The delayed crystallization of the Ti-magnetite would have enriched the intercumulus melt in iron. The net result is this exceptional Fe enrichment of the marginal overgrowth of cumulus crystals as well as Fe-rich pigeonite and unusual incorporation of Fe^{3+} in feldspar from the mesostasis. Similarities and differences of cumulus mineral zoning are used to discuss parental magma composition of nakhlite.

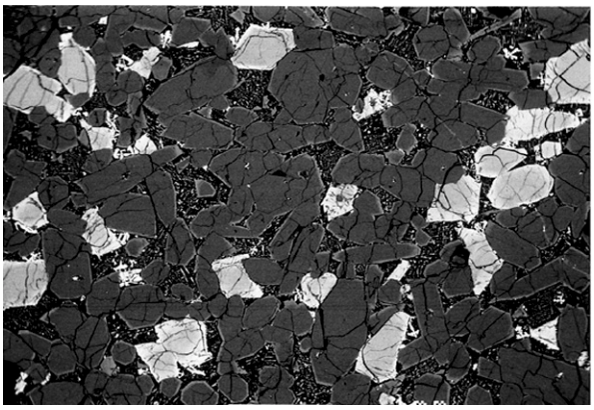

Figure : (Scale 1.4cm = 1mm). Backscattered electron image showing cumulus clinopyroxene (dark grey) and olivine (light grey). The black mesostasis is remarkable for its abundance and white skeletal oxides. Note the zoning towards Fe rich rim which is step in clinopyroxene and smoother in olivine. Such a difference is due to Fe-Mg interdiffusion that is 5-6 order of magnitude faster in olivine (Dimanov A. & Sautter V.2000, *EJM*, 12 749-760).