The polymict eucrite North West Africa 049. P. Beck[1], J-A. Barrat[2], A. Jambon[3], Ph.Gillet[1], J. Blichert-Toft[1], M. Lesourd[4] [1]Laboratoire des Sciences de la Terre (CNRS UMR 5570), Ecole Normale Supérieure de Lyon, 46 Allée d'Italie, 69364 Lyon Cedex 7, France (pbeck@ens-lyon.fr).[2] CNRS UMR 6112 and Université d'Angers, France. [3] CNRS UMR 7057 Université P. et M. Curie 75252 Paris. [4]SCIAM, Université d'Angers.

We report on the petrology and the geochemistry of North West Africa 049 (NWA049), a polymict eucritic breccia containing unequilibrated clasts, recovered last year from Moroccan Sahara. The aim of this study is to describe this unusual eucrite, to compare it with other unequilibrated eucrites and finally to discuss the origin of olivine veinlets found in the pyroxenes.

Petrography : NWA049 contains basaltic clasts in a fine-grained clastic matrix. The clasts we have observed display an ophitic texture and are predominantly composed of plagioclase (about An95) and unequilibrated pigeonite with preserved zoning (core:Fs64Wo6En30 ; rim : Fs38Wo7En55). The pyroxene crystals contain fayalitic olivine (Fa72) on grain boundaries, in thin veins (about 10 microns thick) or in granules. In some areas, intergrowths of plagioclase-silica-fayalitic olivine were observed. The matrix is composed mainly of angular fragments of pigeonite (which contains sometimes olivine granules), and plagioclase. Fractures are filled by terrestrial carbonates. NWA049 resembles Yamato 75011, an Antarctic polymict eucrite.

Chemistry: The bulk composition of NWA49 has been determined using a combination of ICP-AES for major elements and ICP-MS for trace elements : TiO2 0.67 wt%, Al2O3 11.74 wt%, FeO* 18.2 wt%, MnO 0.58 wt%, MgO 7.05 wt%, CaO 10.1 wt%, Rb 0.17 ppm, Sr 94.2 ppm, Zr 44.5 ppm, Nb 3.59 ppm, Eu 0.54 ppm, Gd 2.26 ppm, Yb 1.70 ppm, Th 0.334 ppm, U 0.081 ppm. The REE pattern is flat (Lan/Smn=1.04) and displays a significant negative Eu anomaly (Eu/Eu*=0.87). NWA049 is marginaly weathered as illustrated by the U, Ba and Sr abundances which are sensitive indicators of surface processes. It displays a normal Th/U ratio and its Ba and Sr abundances are slightly outside the trends defined by fresh eucrites. Compared to Yamato 75011,84 [1], which displays the closest petrographic features, NWA49 has lowest REE abundances.

Fayalitic olivine in unequilibrated eucrites was previously described in granules or in veinlets in pyroxenes [2] [3] [4]. Three main processes were proposed for its origin : (1) olivine may be the result of a solide state reaction in which Fe-rich pyroxene is destabilised in olivine plus a silica polymorph [2] [4]; (2) Takeda et al. [3] suggested that an impact-produced fayalitic melt was injected threw the fractures of the rock; (3) fayalitic olivine is a magmatic phase [2]. Models (1) and (2) are unlikely here. We examined the pyroxenes using at high magnification by FEG-SEM in order to detect exsolutions features. Very thin exsolutions (less than 0.3 microns) were observed near the olivine veinlets and silica is lacking. These destabilisations seem insufficient to produce fayalitic segregations. Model (2) seems inconsistent as veinlets are always at grain boundaries and never cross the Mg-rich cores. In addition, fayalitic melts such as those suggested by [3] seem more than enigmatic. A primary magmatic origin for olivine in NWA049 is our preferred interpretation.

References:

[1] Shimizu and Masuda (1986) *Geochim Cosmochim Acta* **50**, 2453-2460. [2] Kozul et Hewins (1989) *Meteoritics* 24, 289. [3] Takeda et al. (1994) *Earth. Planet. Sci. Lett.* **122**,183-194 [4] Buchanan et al. (2000) *Meteoritics* **35** 1321-1331.