NEW METEORITE FINDS FROM THE LIBYAN SAHARA; D. Weber and A. Bischoff, Westfälische Wilhelms-Universität, Institut für Planetologie, Wilhelm-Klemm-Str. 10, 48149 Münster, Germany.

In the years 1994 and 1995 two hundred and twenty-two meteorite samples were recovered from various locations in the libyan part of the Sahara. These locations include the regions Hammadah al Hamra (125 meteorites), Dar al Gani (93), Sarir Quattusah (2), Sarir Tibesti (1), and Majdul (1). So far, about 90 samples were classified. Beside abundant H, L, and LL chondrites, fourteen meteorites were recognized as carbonaceous chondrites, four as achondrites, and one as a R-chondrite.

Introduction: As mentioned before, 222 new meteorite samples were discovered in the libyan desert. Generally, most meteorites were found as individual pieces, but in some cases several or many fragments exist belonging to one meteorite which was broken up during impact or terrestrial weathering. These fragments do not have individual numbers. The recovered meteorites have total masses varying from 30 g to 50 kg, mostly between 100 and 1000 g. Compared to the meteorite population of the algerian Sahara [1], the libyan samples seem to be stronger affected by terrestrial weathering. Generally, the analysed meteorites are moderately (W2) to heavily (W4) weathered [1,2]. Only a few pieces are (very) minor (W0-W1) influenced by terrestrial weathering processes. The degree of shock metamorphism was obtained by using the shock classification system for olivine and plagioclase [3]. The analysed meteorites show shock stages in the range of S1 to S5 with a peak at S2 and S3. In the following, we will give a brief summary of the characteristic features of the meteorites analysed so far. A complete classification of individual meteorites will be published in the next Meteoritical Bulletin.

Rumuruti chondrites: One of the meteorites, Dar al Gani 013, definetely belongs to the R chondrite group. It is the second R chondrite found in the Sahara after the recognition of Acfer 217 as an R chondrite [4]. Due to the different petrology and texture, both samples are certainly not paired. The meteorite Dar al Gani 013 is a breccia containing unequilibrated (subtype: <3.5) and equilibrated rock fragments of different petrographic types. Therefore, it can be classified as a R3-6 chondrite. Olivine within the equilibrated clasts has a peak in the Fa-distribution at 39 mol%. A detailed petrographic and chemical description of Dar al Gani 013 is given by [5].

Carbonaceous chondrites: So far, fourteen of the 222 meteorites were recognized as carbonaceous chondrites. Most of these samples seem to be related to the CO3 chondrites. Based on petrographic observations, the chemical composition and the oxygen isotopes they represent at least four distinct falls. More informations about the libyan carbonaceous chondrite population can be found in [6]. One of the samples (Hammadah al Hamra 073) is of high interest having equilibrated olivines (both in chondrules and matrix), a chondritic texture, and no obvious similarities to the CK chondrite group [6].

Ordinary Chondrites: Thirty-three of the classified meteorites can be assigned to the H chondrite group. Petrographical, they usually belong to the types 5 and 6, only some to type 4. So far, no type 3 H chondrite has been recognized. Most of the H chondrites are of shock stage 2, followed by S3 and S1. Only one sample shows S4. Three H chondrites are breccias. Some of the H chondrites contain shock veins and/or (impact) melts.

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Twenty meteorites can be classified as L chondrites. Most of them are L6 chondrites, whereas only some are L5 chondrites. Two L chondrites are breccias (L4-5 and L5-6) containing rock fragments with a similar chemical composition as the host meteorite but with a different petrographic type. One (Hammadah al Hamra 084) contains a feldspar normative melt, probably formed *in-situ*. Usually, the L chondrites are higher shocked than the H chondrites. Due to the relative high shock stage, most of the studied L chondrites contain shock veins.

Two meteorites are L/LL chondrites with a chemical composition of the equilibrated olivines and pyroxenes between the L and LL range. Furthermore, two type 3 meteorites are classified as LL(L) chondrites. Both samples (Hammadah al Hamra 096 and Sarir Quattusah 001) exhibit unequilibrated olivines and pyroxenes with a percent standard deviation in their chemical compositions of more than 50 (subtype <3.5). Based on petrographic characteristics we can not unambigously decide, whether these meteorites belong to the L or the LL chondrite group.

Nine samples are LL chondrites with a range of their petrographic type between 3.9 and 6. Most of these meteorites are breccias containing rock fragments of different petrographic types and sometimes, in comparison to the host meteorite, of different chemical composition. In the latter case the compositions of olivines and pyroxenes are still in the LL spread. Generally, the shock stages with a peak at S3 are not as high as it is the case for the L chondrites.

Achondrites: At least four of the new samples are achondrites. One of these is an eucrite (Hammadah al Hamra 059) with a total mass of 143 g. It is heavily weathered (W3) and brecciated. Pyroxenes show a bimodal distribution in their chemical compositions. Most pyroxenes have a Fs-component of about 62 mol%. However, some pyroxenes show lower FeO contents with a peak at 35 mol% Fs. Plagioclase is variable in composition (An_{74-93}).

Hammadah al Hamra 064 (136 g) and Hammadah al Hamra 126 (1998 g) are ureilites. Both samples show the shock stage S3 and the weathering degree W3. Olivines within the main lithological components are equilibrated containing Fa 22.0 mol% (HH064) and Fa 21.1 mol% (HH126). However, in Hammadah al Hamra 126 matrix olivines with a chemical spread of Fa 1 to 12 mol% are present. Therefore, it appears that these two ureilites are not paired. This is also supported by the chemical composition of the pyroxenes. Although pyroxenes in both meteorites show a similar ferrosilite component (Fs 18.7 mol% in HH064 and Fs 18.0 mol% in HH126), they differ considerably in their CaO contents. Pyroxenes within HH064 exhibit 4.6 mol% Wo, whereas those from HH126 have an average wollastonite component of 8.4 mol%. In addition, HH126 shows a brecciated texture, which is less obvious in HH064. The fourth achondrite, Dar al Gani 084 (277g), is also an ureilite (W3; mineral composition: $Fa_{20.9}$; $Fs_{14.3}$; $Wo_{5.0\pm1.1}$). Compared to the ureilites described before, it has a completely different texture. Dar al Gani 084 contains abundant shock veins and shows mosaicized olivines which is probably due to a very high degree of shock metamorphism [7].

References: [1] Bischoff and Geiger (1995) Meteoritics **30**, 113; [2] Wlotzka (1993) Meteoritics **28**, 460; [3] Stöffler et al. (1991) GCA **55**, 3845; [4] Bischoff *et al.* (1994) Meteoritics **29**, 264; [5] Jäckel *et al.* (1996) this issue; [6] Weber *et al.* (1996) this issue; [7] Goodrich (1992) Meteoritics **27**, 327.