ON THE MINERALOGY OF THE H3-6 REGOLITH BRECCIA DJERMAIA

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Introduction: The Djermaia chondrite, which fell in 1961 in the Republic of Chad, is a light-dark structured meteorite and was recognized as a regolith breccia. Track density analysis [1], noble gas measurements [2] and cosmogenic nuclide studies [3] were performed to investigate pre-irradiation effects and exposure history. However, except for the olivine composition (Fa19, determined by X-ray diffraction) given by [4] no mineralogical data of Djermaia were published so far. Here we present the preliminary results of mineralogical investigations obtained by optical microscopy, analytical SEM and electron microprobe analysis.

Petrography: By visual inspection of polished cuts (total area ~90 cm²) three lithologies could be recognized. The main lithology A has a fine-grained chondritic texture consisting of dark brownish-grey type 3 material with numerous “sharp” chondrules. Lithology B is light brown to grey coloured and comprises several cm-sized angular to subrounded clasts. Most of these clasts have a coarse-grained chondritic texture corresponding to petrologic type 6. The apparently shock-blackened dark lithology C contains numerous shock veinlets, cellular metal-troilite mixtures and troilite-rich regions where all cracks in silicate grains are filled by sulfide. In places, lithology C also contains mm-sized impact-melt clasts and dikelets having quench textures consisting of acicular olivine crystals embedded in a partly devitrified glassy mesostasis.

Mineral compositions: Olivine and low-Ca pyroxene are clearly unequilibrated in lithology A having compositions in the ranges of Fa4.9-25.3 and Fs2.1-16, respectively. A few Ca-rich pyroxenes overgrown on low-Ca pyroxene have Fs2.4-10.7Wo12.4-49. In lithology B (Fe, Mg)-silicates are predominantly equilibrated with compositions typical for H-group chondrites. Mean compositions for olivine and low-Ca pyroxene are Fa19.6 (range Fa18.8-20.6) and Fs17.5Wo1.4 (range Fs16.8-19.0; Wo1.0-1.7), respectively. In lithology C most olivines (Fa18.4-20.5) and low-Ca pyroxenes (Fs16.1-19.0) from the shock-blackened regions also are equilibrated. Olivines from the impact-melt clasts exhibit a marked zoning with Fa9.1 (core) up to Fa17.7 (rim).

Mean (Ni; Co)-contents (in wt%±1σ) of low-Ni metal in lithology A (6.9±0.6; 0.46±0.05), lithology B (7.0±0.1; 0.46±0.02) and lithology C (6.8±0.2; 0.54±0.04) are within the range reported for kamacite compositions of H chondrites, [e.g., 5]. However, low-Ni metal in cellular metal-troilite mixtures is of martensitic composition (8.0±0.3; 0.48±0.04). Troilite in cellular metal-troilite mixtures contains 0.13±0.04 wt% Ni, whereas all other measured troilite grains have Ni-contents <0.02 wt%.