THE ANTARCTIC IRON METEORITE STEINGARDEN NUNATAKS (STG) 07009: PRELIMINARY RESULTS OF A MULTI-DISCIPLINARY STUDY

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In 2007, the Bundesanstalt für Geowissenschaften und Rohstoffe (BGR, Hannover, Germany) carried out a reconnaissance survey of a hitherto unexplored area in Queen Maud Land, Antarctica, to assess the regional potential of meteorite accumulations. As a result of the search campaign 15 meteorites were found and later officially named after the Steingarden Nunataks (STG), being the nearest geographical feature (DELISLE et al., 2015). Here we report the first results of a multi-disciplinary study of the iron meteorite STG 07009, including optical microscopy (OM), analytical scanning electron microscopy (ASEM), electron microprobe analysis (EMPA), instrumental neutron activation analysis (INAA), and accelerator mass spectrometry (AMS). STG 07009 was found as one complete individual specimen weighing ~ 32.6 kg. The main mass (32.2 kg) is stored at the BGR, the type specimen (37.3 g) is kept at the Natural History Museum, Vienna. Macroscopically, the meteorite appears well preserved, displaying a greyish-black surface with numerous cm-sized regmaglypts and does not show any oxidation features in its interior. OM investigation of polished and etched platelets revealed that the meteorite is a plessitic octahedrite with almost all kamacite spindles (apparent diameter = 0.08±0.03 mm, N = 30) having nuclei of schreibersite. Compositionally, kamacite and schreibersite are rather uniform with averaged compositions (6.42 wt% Ni, 0.78 wt% Co) and (45.32 wt% Fe, 39.60 wt% Ni, 0.13 wt% Co, 15.28 wt% P), respectively. However, a detailed EMPA investigation revealed that in places, the spindles contain schreibersite-metal intergrowths, exhibiting complex textures and compositions. Based on bulk chemistry data obtained by INAA, STG 07009 is classified as ungrouped iron with no close relatives (J. T. WASSON, UCLA, personal communication). The corresponding INAA data are 20 µg/g Cr, 6.76 mg/g Co, 131.9 mg/g Ni, 282 µg/g Cu, 10.4 µg/g Ga, 166 µg/g Ge, 14.8 µg/g As, 74 ng/g Sb, 0.29 µg/g W, 16 ng/g Re, 0.129 µg/g Ir, 4.4 µg/g Pt, and 1.606 µg/g Au. AMS measurements (performed by K. NISHIIZUMI and M. CAFFEE at PRIME Lab, Purdue University, USA) of the cosmogenic radionuclides ^{10}Be, ^{26}Al, and ^{36}Cl gave saturation activities (dpm per kg meteorite) of 4.28±0.13, 3.44±0.23, and 17.55±0.72, respectively. Corresponding age calculations gave for STG 07009 a ^{36}Cl/^{36}Ar cosmic-ray exposure age of 780±100 Myr and a ^{10}Be-^{36}Cl/^{10}Be terrestrial age of 75±33 kyr. The latter is rather young when compared to the overall terrestrial age distribution of Antarctic meteorites (JULL, 2006).

DELISLE, G., BRANDSTÄTTER, F., KOEBERL C. (2015): Ann. Naturhist. Mus. Wien, Serie A, 117, 5-34.
JULL, A.J.T. (2006): In LAURETTA, D., MCSWEEN H. (eds.): Meteorites and the early solar system II, 889-905.