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AWARUITE (Ni_3Fe) IN THE GENOMICT LL CHONDRITE PARAMBU: FORMATION UNDER HIGH fO_2. J. Danon, CBPF, Rio de Janeiro, Brasil; M. Christophe Michel-Levy, CNRS, Paris, France; C. Jehanno, CNRS-CEA, Gif-sur-Yvette, France; K. Keil, Univ. of New Mexico, Albuquerque, NM, USA; C.B. Gomes, Univ. de Sao Paulo, Brasil; R.B. Scorzelli and I. Souza Azevedo, CBPF, Rio de Janeiro, Brasil

Parambu (fall, July 24, 1967) is a regolith breccia consisting of submillimeter-to centimeter-sized, light-colored clasts, embedded into a fine-grained dark-colored matrix. Mineral and bulk composition indicate LL-group classification. Texture and mineral compositions of matrix and clasts vary from unequilibrated (petrologic type 3) to highly equilibrated (petrologic type 6) LL material, indicating that Parambu is a genomict LL-group breccia. We report results of optical and scanning electron microscopy, electron microprobe, x-ray diffraction and Mössbauer techniques. Results and conclusions. A. The metallic NiFe phases are kamacite, zoned taenite (Ni 25-50%), tetrataenite and awaruite (Ni_3Fe) associated with troilite and pentlandite. Tetrataenite was identified by its optical anisotropy, Ni content (50%), lattice parameter (a_o = 3.58 A), and hyperfine field of 288 kOe and quadrupole splitting of +0.17 mm/s in Mössbauer spectroscopy. Awaruite, previously only described in Allende, in some unequilibrated ordinary chondrites and as a terrestrial weathering product in Odessa, was identified by its Ni content (~68 %), lattice parameter (a_o = 3.56 A), and by a sextet with a hyperfine field of 302 kOe indicating an ordered structure, and no quadrupole interaction in Mössbauer spectroscopy. We suggest that the abundance of Ni-rich phases, particularly of awaruite, is due to the highly-oxidized nature of Parambu, indicating formation under unusually high fO_2 for LL-group chondrites. This highly oxidized nature is indicated by low contents of metallic NiFe (1.42%) (avg. LL-group is 4.39%) and the generally very high FeO contents in olivine and pyroxene (Fa_{32} and Fs_{26}, respectively) that are extreme values for LL-group chondrites. This accounts for the low average bulk Ni^o/Fe^o ratio (0.55; avg. LL-group 3.57). B. Different clasts contain different populations of metallic NiFe. Specifically, awaruite is not associated with tetrataenite or kamacite. This is in keeping with the genomict nature of the rock. C. The occurrence of tetrataenite suggests slow cooling through 320°C which was not disturbed by a late metamorphic event. This is in agreement with the variable compositions of the major silicates in different clasts and matrix. D. The compositional gap between tetrataenite (~ 50% Ni) and awaruite (~ 68 % Ni) and the homogeneous composition of the latter in Parambu may be explained by the preferred stability of the Ni_3Fe composition in the Ni-Fe system.

IN: ~~Meteoritics~~

IN: Meteoritical Society Annual Meeting, 44, 1981, Berna. Suiça
Abstracts.