Faina, A New Brazilian Plessitic Octahedrite From Group IAB.

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History: A single mass with a total weight of 440 grams was found by Mr. G. Rodrigues in 2011 when digging a hole for the septic tank of his house, suspecting to be a meteorite by having seen our divulgation program at a TV show.

Description: The mass is a rough irregular prism measuring about 7 × 4 × 5 cm and its external part is generally smooth with no signs of fusion crust or heat affected α2 zone removed by weathering. Polished and etched sections exhibit a complex plessitic matrix with at least two different size orders of Widmanstätten pattern. The bandwidth of α spindles is typically 80 μm wide and 10-25 or 1-4 times their widths, respectively. Also presents some large kamacite bands unrelated with the plessitic Widmanstätten pattern as they are formed by swathing nucleated kamacites and growth around schreibersite crystals. The spindles are uniformly oriented on at least two austenite crystals. The ferrite of spindles shows subgrain boundaries, but no Neumann lines. Troilite occurs as few small spaced nodules.

The bandwidth of the kamacite spindles were measured using a composite image obtained under a light microscope which was connected to a computer and analyzed with the ImageJ software – a freely available image processor and analyzer. Size distribution of the bandwidths shows a bimodal distribution of kamacite spindles. The large kamacite population is formed by a single long kamacite network bordering larger plessite fields while the smaller kamacite fields are more visible associated with small plessite fields. This smaller size of plessitic domains have sometimes incoherent orientation possible due to many small phosphide crystals that nucleates swathing kamacite crystals, also observed that an impingement of ferrite/ferrite grain boundaries give the aspect of granular kamacite.

Geochemistry: (J.T. Wasson, UCLA [1]) INAA: 8.67% Ni; 0.87 % Co; 28 ppm Cr; 186 ppm Cu; 23.4 ppm Ga; 83 ppm Ge; 13 ppm As; 6 ppm Ru; 3.91 ppm Ir; 1.40 ppm Au. Composition of major phases (I.P. Ludka, IGEO-UFRJ [1]) WDS/EPMA: kamacite (Ni=5.56±0.4; Co=0.61; N=20), taenite (Ni=28.8±1.4; Co=0.61; N=16), phosphides (Ni=27.7±1.2; P=16.68±0.7, N=12) all in wt%, typical taenita microprobe line scan (33.76; 32.18; 23.9; 7.41; 6.78; 7.01; 7.1; 7.04; 7.15; 9.57; 33.84) all in wt%.

Cooling rates: The estimated cooling rates by kamacite bandwidth method [2] and by the taenita "M-profile" [3-4] based on the Ni concentration that indicate a very fast cooling rate, although there is few comparative data on the plessitic octahedrites in the literature.

Conclusion: Faina is a plessitic octahedrite which resembles Ballinoo, Wiley, Crathèus, although a very low Ni content for a plessitic octahedrite and other chemical contents of Ni, Ga, Ge and Au conduct by J. T. Wasson placed Faina apart of others IIC and classify it as belonging to IAB - complex with no relative, although resembling EET 83000, shows no visible silicates [1].

It has to be also considered a two distinguished different cooling events, one precipitates the schreibersite with the formation of swathing kamacites and the other shows a precipitation and growth of Widmanstätten pattern in two steps argued that the meteorite forms over a wide temperature range.

References: [1] meteoritical bulletin [2] Buchwaldt, F.V. (1975) Handbook of Iron Meteorites. Univ. California Press, Berkeley, Califomia. 1375 pp. [3] Wood, J.A.(1964) Icarus,3,429-459. [4], Saikumar, V.; Goldstein, J. I. (1988) *GCA*, 52,711-726.