DISCOVERY OF IMPACTITE AT THE ODESSA METEORITE CRATER. T. R. Smith, P. W. Hodge, *Department of Astronomy, Box 351580, University of Washington, Seattle, WA 98195-1580, USA.*

The Odessa meteorite craters were formed by the hypervelocity impact of a type IAB iron meteorite [1] about 50,000 years ago [1,2] in the high plains region of western Texas. The extraterrestrial nature of the Odessa craters was established by the presence of thousands of meteorite fragments [3], the morphology of the main crater [4] and by the existence of tons of microscopic meteoritic material surrounding the crater [5]. To this evidence we now add the discovery of small pieces of impactite containing metallic spherules, found in the soil surrounding the Odessa craters.

The impactite at the Odessa craters was discovered during a preliminary examination of the magnetic fraction of soil samples from around the main crater. The impactite seems to be an ubiquitous component of the magnetic fraction of the soil within 300 meters of the main crater's rim.

The impactite at the Odessa craters occurs as very small ($<$ 2 mm, typically $\sim$200-500 μm), very fragile, dark, vesicular particles. No ponderable fragments of impactite are known to have been recovered from the Odessa site.

Our examination of the polished sections of the impactite shows that the individual impactite particles exhibit a range of morphologies that fall between two end-member types. At one end the impactite particles are characterized as being very vesicular in nature, with some particles being dominated by void spaces. These particles often have relic mineral grains in addition to the metallic spherules embedded in the matrix. We refer to particles of this type as having a Type I morphology (Figure 1). At the other end the impactite particles are characterized by having a solid matrix that lacks any vesicles or relic mineral grains, with the matrix tending to be homogeneous in regions that contain the metallic spherules, but which may appear different in different regions of the same particle. We refer to particles of this type as having a Type II morphology.

The mechanical strength of the impactite particles is very low. The particles are easily crushed by hand. Not all of the metallic inclusions are spherical. Many of them are irregular in shape and often resemble partial spherical shells or dumbbells. The irregular shapes are more commonally found in the more vesicular Type I impactite.

Microprobe analysis of the metallic spherules in the impact show that: 1) The Ni and Co abundances for all of the spherules are significantly enhanced compared to the bulk composition of the Odessa meteorite; 2) The Co abundance is positively correlated with the Ni abundance up to a Ni abundance of about 50%, beyond which point the Co abundance is negatively correlated; 3) Spherules in Type I particles have Ni abundances in the range of 15 - 30%, whereas spherules in Type II particles have Ni abundances that range from 20 - 70%; 4) The elemental abundances of spherules within each particle are relatively similar with no particle containing spherules that span the entire range of measured abundances. The features 1 and 2 are common characteristics of impactite spherules from other craters, as well as being characteristic of the metallic cores of deep-sea spherules [6].

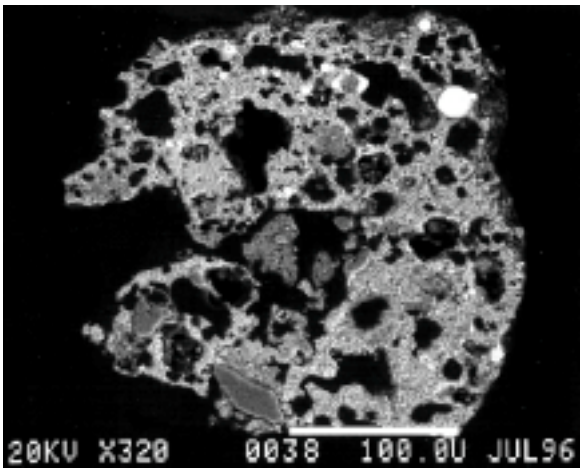

Figure 1 BSEM image of a Type I impactite particle. The metallic spherules appear as the white regions. Relic mineral grain can be seen in the lower left of the particle.

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References: [1] V. F. Buchwald. (1975) *Handbook of Iron Meteorites.* [2] J. D. Buddhue. (1957) *The Oxidation and Weathering of Meteorites.* [3] L. LaPaz. (1965) *Catalog of the Collection of the Institute of Meteoritics.* [4] D. M. Barringer. (1928) *Proc. Acad. Natural Sciences*, 80, 307-311. [5] T. R. Smith. (1995) PhD thesis, University of Washington. [6] R. Brett. (1967) *Amer. Mineral.*, 52, 721-733.