

Possible meteoritic materials in spherules discovered in the Oikeyama impact crater

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Sakamoto et al. (2010) reported a first meteor crater in central Japan, where is located at the Mt. Oikeyama in Shirabiso highland, Iida City, Nagano Prefecture. It has been supported by the shocked quartz with planar deformation features (PDFs) and planar fractures (PFs) and a negative gravity anomaly around the crater (Sakamoto and Shichi, 2011). Recently, large numbers of spherules were found out at around the Oikeyama crater site. In this study we have conducted to clarify the origin of the spherules by the optical examination and chemical analysis.

A topographic feature of the crater indicates about 900 m in diameter, whereas its half of the rim in the eastern side was collapsed away under geological conditions. A rip-up crust containing a large number of spherules was observed at the slope outside 400m far from the rim. Eighty-percent part of the rip-up crust is composed of the spherules and their fragments, and ten-percent part is occupied by neighboring rock fragments and mud as a matrix. Most spherules indicate an imperfect globular shape and translucent to opaque under a microscope. Pyrite commonly occurs in the crust associated with the spherules, where small particles of pyrite are found as an ingrown crystal into the spherule. A polarizing microscopy shows that the spherules contain recrystallized and cryptocrystalline materials with microlite texture. There were many types of spherules including aggregate structure incorporated with other small spherule and zoned texture with the core of opaque material and rim of translucent one.

We obtained chemical-compositional map of Mg, Si, S, V, Cr, Mn, Fe, Ni, and Ir in the spherules and associated fragments in the rip-up crust by the use of a laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS). The result indicates inhomogeneous distribution of such elements in and around the spherules. Relative high concentrations of Ni, V, Cr, Mg, Mn and Fe are observed, suggesting the same type of spherules in the Late Archaean Paraburdoo impact crater reported by Izmer et al. (2013).

Oikeyama area geologically consists of sandstone, mudstone and chert belonging to Chichibu Paleozoic terrain, where the elements of Ni, V and Cr are not predominant in these sediments. Pyrite is not usually found in the volcanic-aeolian sediments in this area, although pyrite is frequently accompanied with the spherules in the rip-up crust.

References

Sakamoto et al. 2010, *Meteorit. & Planet. Sci.* 45; Sakamoto and Shichi 2010, *Japanese Society for Planetary Science* 19, 4; Izmer et al. 2013, *J. Anal. At. Spectrom.*, 28;

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