NEW IMPACT FRAGMENTS OF FE-NI-SI IN SPHERULES AT TAKAMATSU CRATER, JAPAN.

Y. Miura, S. Fukuyama, and A.Gucsik. Department of Earth Sciences, Faculty of Science,Yamaguchi University, Yoshida, Yamaguchi 753-8512 Japan. yasmiura@po.cc.yamaguchi-u.ac.jp

Introduction: Takamatsu crater which is r e-cently recognized as a "buried circular structure" on the hard Rhyoke granitic rocks of southern part of Takamatsu, Kagawa, Japan, is considered to be typical complicated crater on active islands of Japan.

There are two different hypotheses of Takamatsu crater's origin as impact crater of meteorites [1,2,3] or volcanic crater of of cauldron type. The main purpose of present paper is to elucidate spherule and Fe-Ni-Si small grains as new material evidence of impact reaction at impact crater of active volcanic regions of Japan.

Impact Reaction to Form Spherule and Fe-Ni-Si grains: Meteoritic impact produces characteristic impact reaction of vapor (V), liquid (L) and solid (S) state for short time to form complicated mixed or new materials through the VLS impact reaction as shown in Table 1. Among characteristic impact indicators of shocked quartz, Ir anomaly, and spherule, spherule with Fe-Si or Fe-Ni-Si grains (designated as spherule I-M or II-M) are considered to be new type of impact indicators.The spherule of volcanic origin (designated as spherule I-T or II-T) does include minor Al or Ti (but without any Ni) at Mt. Unzen, Japan. From compositional points of views, spherules formed by impact reaction contain Fe-Si or Fe-Ni-Si grains (as spherule I- M or II-M in Table 1) .

Spherules with Fe-Ni-Si grains from Tak a-matsu crater: Three types of Fe-Ni-Si grains were found as follo ws from glassy blocks of the Takamatsu crater.

a) Fe-Ni rich grains in black glassy breccias (TK-15-1G;Fe=63wt.%,Ni=5.0wt.%) with large size of ca.50 micrometers in diameter [2,3].

b) Fe-Ni rich grain (3 micrometers in size) in black glassy spherule of 400 micrometers in size (TK-15-3G; Fe=36wt.%, Ni=2wt.%, and Si-Al-K).

c) Fe-Ni rich grain (40x80 micrometers in size) in spherule in 750 micrometers in size (TK-21-1G; Fe=87 wt.%, Ni=7wt.%, and Si-Al-Ca in the rest).

These Fe-Ni-Si grains are covered by vacancy of gas state which is considered to be relict of impact gas-state. This unusual texture of trapped gas-state with Fe-Ni-Si grains of spherules are typical texture at theTakamatsu crater formed at active islands of Japan. After discovery of the above (a) type Fe-Ni-Si grains in glassy breccias of 5 cm in size, spherules of typical ejecta by impact event spherules (b) and (c) types are found by ultra-sonic cleaning of these glassy breccias and collected on magnetic plates. From these magnetic spherules, it is difficult to find Fe-Ni-Si grains by the following two reasons.

1) Fe-Ni-rich grains included gas-rich blocks in spherule are easily moved if strong magnetic devices are used during observations of optical or electron microscopy.

2) Fe-Ni-rich grains from 3 to 80 micrometers in size are difficult to find by normal method of scanning elecron microscopy or optical mocroscopy. Volume of vacancy in gas state of these spherules is larger at TK-21 sample (found at rim or outside of the Takamatsu crater), but smaller at TK-15 sample (found at elevated galssy blocks of Jissouji-Yama inside of the Takamatsu crater). These results indicate that spherules with Fe-Ni-Si grains in gas-rich regions are considered to be formed during impact event of the Takamatsu crater formation. Detailed age of impact event will be known from zircon dating of zircon-bearing spherule.

Summary : The following results can be su m-marized in this study.

1) Fe-Ni-Si grains as mixed compositions formed by impact on granitic rock are found in spherules included to glassy blocks on the surface of buried Takamatsu crater, Japan.

2) Spherules with fine Fe-Ni-Si grains are new material evidence of impact reaction.

3) Gas-rich vacant regions with the Fe-Ni-Si grains included in "spherule" are trapped materials during formation of spherules on the Takamatsu crater of active islands of Japan.

References:

[1] Kono Y. et al. (1994): ISAS Lunar & Planetary Symp., 27, 67-70.

[2] Miura Y. et al. (1995): LPS, XXVI, 987-988.

[3] Miura Y. et al. (1995): Meteoritics, 30, 551-552.

Table 1. Characteristic impact reaction and compositions of spherules and breccias.

Original materials	Reaction	Impact Crater	Volcanic materials
1) Vapor (V)	**Spherule I-M** (Fe-Si)	Spherule I-T(Si-Fe)	
Rocks/Meteoroids	2) Liquid (L)	**Spherule II-M** (Fe-Ni-Si)	Spherule II-T(Si-Fe-Al-Ti)
(Solid State)	Breccia I-M (Fe-Ni-Si)	Breccia I-T(Si-silicates)	
	3) Solid (S)	Spherule III-M	Spherule III-T
	Breccia II-M	Breccia II-T	