PRELIMINARY STUDY ON NEOGENE MICROTEKTITES IN THE CORE COLLECTED FROM NORTH PACIFIC*

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ABSTRACT: A great number of microtektites were found in core collected from North Pacific. Because abundant microtektites are restricted to a 20-30 cm thick zone of core, we called this zone is miicrotektite layer. The age of sediments concentrated microtektites is from the Pliocene to the Pleistocene epoch. Research results indicate that these microtektites are similar to the North American tektites and the Australasian tektites, but they have the unique property on the chemistry.

1. INTRODUCTION

During the North Pacific Manganese Noduls Investigation in 1983, we collected a large-diameter core (8°00.15'N,176°10.65'W; 3991 m depth of water). This gravity core is 420cm long in total. It is composed of calcureous ooze at 0-320 cm and siliceous ooze at 320-420cm. The magnetic iron cosmic spherules were contained in each sediment samples from top to bottom of the core (average content is 2.3 spherules per 100 gram sediment). A great number of microtektites were found from 270 cm to 300 cm (average content is 15 microtektites per 100 gram sediment). Because abundant microtektites are restricted to a 20-30-cm-thick zone of deep-sea core, we called this zone is microtektite layer.

This core have performed the palaeomagnetism analysis. The age of sedimentary stratum contained mictotektites is from pliocene epoch to pleistocene epoch by the palaeomagnetic and the palaeonotogic analysis (SOA,1986).

Using various analysis technicalities conducted the study on microscopic chracteristics, major-oxide compositions and microstructures of the Neogene microtektites, and pursued their origin.

2. MICROSCOPIC CHARACTERISTICS

Under the binocular steroscopic microscope with as much as 50 X - 70 X magnification, most of microtektites appeared as light yellowish-green small glassy spherules, and individual grain is dumb-bell shape (Fig. 2-(A)). Their average size is 137 μm in diameter, a largest dumb-bell grain's size is 652 X 223 X 151 μm. The average refractive indices of microtektites determined by the oil immersion method is 1.52.

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A.C. Levasseur-Regourd and H. Hasegawa (eds.), Origin and Evolution of Interplanetary Dust, 57–60.

3. MAJOR-OXIDE COMPOSITON

The major-oxide compositions of five Neogene microtektites were determined by electron probing(Table 1).

Table 1. Major-oxide compositions of five Neogene microtektites in a core collected from North Pacific.

	MN-1	MN-2	MN-3	MN-4	MN-5	Site 149*	DSDP 612**
SiO_2	70.54	69.24	69.34	69.13	69.31	64.52	72.30
TiO_2	1.09	1.25	1.07	1.06	1.34	0.70	0.85
Al_2O_3	16.19	16.12	17.40	17.17	15.89	19.38	15.10
FeO	4.16	4.24	3.78	3.92	3.45	6.39	4.80
MgO	2.78	3.21	2.92	3.00	3.62	3.29	1.20
CaO	2.60	2.33	1.93	2.29	5.06	2.35	0.85
Na_2O	0.17	0.13	0.18	0.15	0.14	0.81	0.30
K_2O	2.78	1.95	2.49	2.52	1.24	2.56	3.80

* From B. P. Glass and M. J. Zwart, 1979.

** From C. Koeberl and B. P. Glass, 1988.

These microtektites have SiO_2 contents of about 70%, and the SiO_2 content of each sample are closer. The SiO_2, Al_2O_3, FeO, MgO, CaO and K_2O contents are all similar to the microtektites from Site 149 in the Caribbean sea belong to the North American tektite strewn field (Glass et al., 1979). The chemistry property of Neogene microtektites can not only be seen from the Table 1, but also clearly reflected by the spectral pattern of the energy-dispersive X-ray analysis (Fig.1).

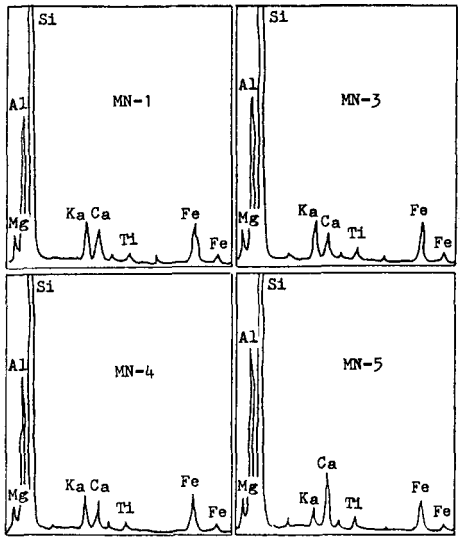

Fig. 1. The Spectrum Patterns of the Energy-dispersive X-ray analysis of the Neogene microtektites in core collected from North Pacific.

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Although the contents of most oxide-compositions of Neogene microtektites are similar to the North American microtektites, but the Na_2O and TiO_2 contents are quite different from the late. Five Neogene microtektites have great low Na_2O contents. The peaks of sodium element of five samples almost can't seek from the energy-dispersive spectrum patterns in the Fig.1. But the TiO_2 contents are much higher than North American microtektites and other microtektites(O'Keefe, 1976; Hanchang, 1984).

4. MICROSTRUCTURES

Several ten Neogene microtektites were selected for further studies using scanning electron microscope (SEM). Five photographys were showed in Fig.2 (from B to F). These photographys showed various sculpturing characteristics. The pits, grooves, mounds, etc. were appeared on the surface of each microtektite, which are similar to the Australasian tektites (Glass, 1974). Some of them are similar to the crater on the Earth(B), which suggest that the microtektites were impacted by one or many small particles with superhigh-velocity impact and strong kinetic energy in outer space, and proved an important evidence for extraterrestrial origin. Some Neogene microtektites have circular, flat-topped, elevated area at top (C and D), which suggest that a sharp mound was pared by other particles when flying. A deep groove was appeared on the microtektites (E and F), perhaps which was as the result of attact by particles.

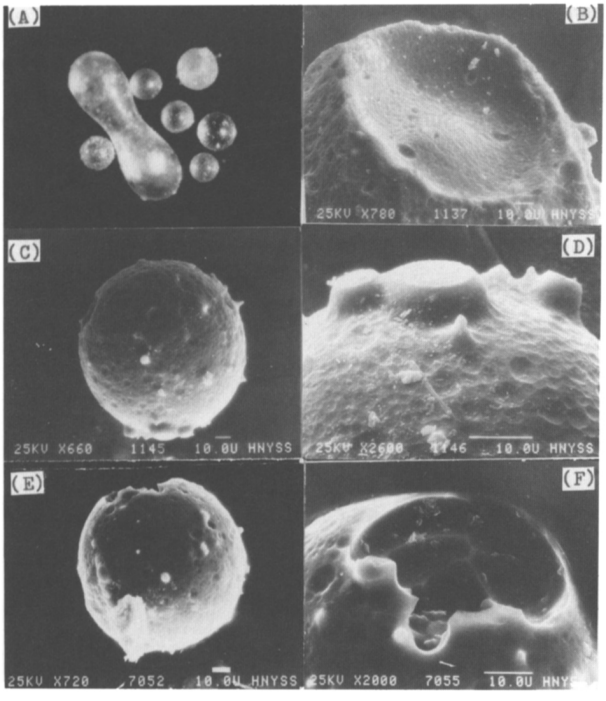

Fig. 2. Microscope and SEM photographs of Neogene microtektites. (A) Microscope photograph, size of a largest dumb-bell grain is 652 X 223 X 151 μm; (B) Like-meteorite crater rebound elasticity microimpact crater on microtektite; (C and D) A Neogene microtektite with circular, flat-topped, elevated area at top; (E and F) A Neogene microtektite with a great number of grooves and a largest groove on microtektite.

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5. DISCUSSION

Based on present these data we obtained following two preliminary views.

(1) These Neogene microtektites found in core collected from North Pacific are similar to the North American microtektites on major-oxide composition and similar to the Australasian tektites on microstructures, but they have great low Na_2O content and much high TiO_2 content, which indicate that perhaps these microtektites not belong to any known tektite strewn field.

(2) Based on some special microstructures on the surface of Neogene microtektite and other analysis data (for example, presence of traces elements Os, Ir, Ni, Co, Cr, etc. determined by INAA) we suggest that these microtektites come from outer space.

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