XI. MAGNETIC PROPERTIES OF OCEANIC IGNEOUS ROCKS DREDGED IN THE NORTHWEST PACIFIC BASIN

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Sampled sites and descriptions studied here are shown in Table XI-1.

PAP MD-1 spinner magnetometer, Bison magnetic susceptibility meter and magnetic balance are used for measuring. X-ray diffraction analysis is used for identifying magnetic mineral and lattice parameters of spinels are calculated. Measured values are NRM (Natural Remnant Magnetization), k (Magnetic Susceptibility), Q ratio (NRM/k/0.45 Oe), Js (Saturation Magnetization), Curie Temperature (or Js—Temperature curve),

Table XI-1 Samples studied.

	Lat.	Lon.	Depth	Description
D140–3 —				
—				
—	35°43.3′N	142°37.1′E	4,550 m	
D140–4 —	—	—	—	
—				
—	—	—	—	brittle
—				
—	—	—	—	
D140–7 —	35°44.1′N	142°37.4′E	4,400 m	
—				
—				
—				
D140–8 —				
D144–2	37°59.2′N	145°58.4′E	3,350 m	
	—	—	—	porous
	—	—	—	
	37°59.2′N	145°58.7′E	3,150 m	

Table XI-2 Results measured.

	NRM (emu/cm³)	k (× 10⁶/cm³)	Q ratio	Js* (emu/g)	Curie Temp.
D140–3	1.14 (× 10^{-3})	1,194	2.07	0.77	468°C
D140–4	2.13	1,446	3.2	2.85	
D140–7	1.4	1,464	2.08	1.0	
D140–8	0.74	262	6.13	0.92 (−100°C)	70°C
				0.4 (25°C)	
D144–2	3.39	518	14.2	0.82	431°C

	Lattice parameter	Specific gravity**	F*** (Anisotropic susceptibility)
D140–3	8.355 A	2.864 (g/cm³)	1.016
D140–4	8.362	2.483	1.022
D140–7	8.370	2.819	1.028
D140–8	8.487	2.953	1.022
D144–2	8.361	2.277	1.009

*Js is measured for bulk rock on chips of about 150 mg.

**The value is measured as weight in air/cylinder's volume.

***F value is defined by the method of B. B. ELLWOOD (1975). $F \times a/\sqrt{bc}$ a, b and c are eigen values of magnetic anisotropic susceptibility.

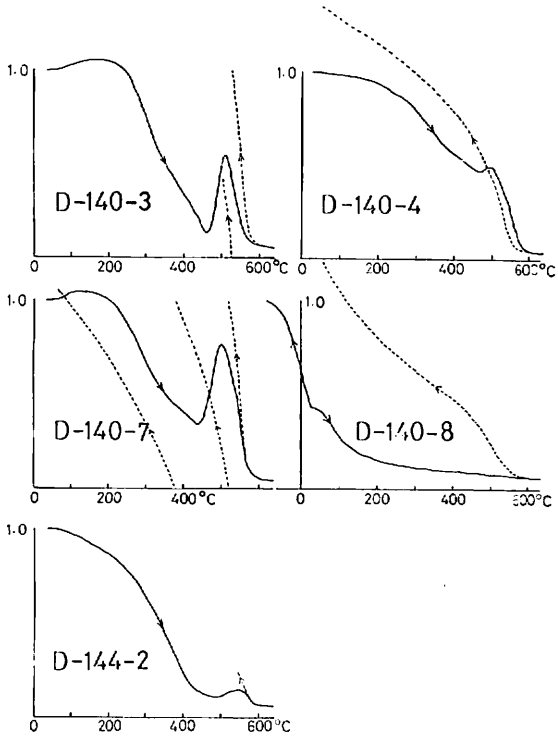

Fig. XI-1 Saturation magnetization — temperature curves. Magnetic field is 5.5 k Oe and a little weak in low temperature measurement. Saturation magnetization at 25 °C is normalized to 1.0, except D 140–8, about which normalized at −100 °C. Solid lines are the curves on heating and broken lines on cooling.

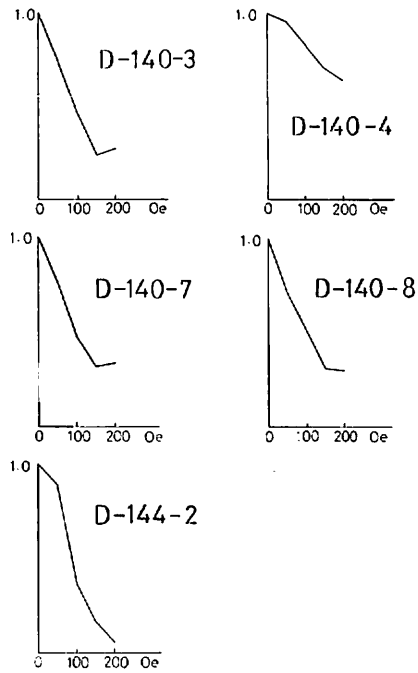

Fig. XI-2 AF partial demagnetization curves. AC field of 50 Oe, 100 Oe, 150 Oe and 200 Oe are supplied.

Lattice Parameter, Specific Gravity and Anisotropic Susceptibility. Magnetic susceptibility is measured on a cylindrical sample (2.54 cm diameter 2.5 cm height) by Bison. Correction of length was done on these values in Table XI-2. Js is measured by comparing with pure nickel chip, so these values are considered to be rough approximate values. Results are summarized in Table XI-2.

Saturation magnetization—temperature curves are shown in Fig. XI-1. All of these have feature of oxidized titanomagnetite. D140–3, D140–4 and D140–7 seem to be much oxidized, and D140–8 and D144–2 don't seem so much. D140–4 has a little heamatite, which was detected by X ray diffraction analysis. D140–8 has a low Curie temperature and high lattice parameter, which shows that the magnetic mineral is titanomagnetite with a high titanium ratio. From the value of Curie temperature and lattice parameter, the ratio of ulvöspinel/magnetite seems to be about 0.7.

The stability of remanent magnetization is shown in Fig. XI-2. Remanent magnetization of D140–4 decreases 2/3 at 200 Oe AF demagnetization, and is metastable. The remanent magnetization may be caused by CRM (chemical remanent magnetization), because it seems to be very much oxidized and contains hematite. Others decrease 1/3

at 150 Oe and not so stable. The oceanic igneous rocks commonly have unstable remanent magnetization which may be caused by the fact that oceanic igneous rocks are not oxidized at high temperature, so that their magnetic minerals are much larger than those of igneous rocks oxidized at high temperature in air where the coercive force is very small. A sharp down of the remunent magnetization near oceanic ridge may be explained by a small coercive force.

The F value of D144–2 is low and those of D140–4, D140–7 and 140–8 are a little high, but smaller than 1.045 which is defined as the minimum value of extrusive volcanics by ELLWOOD (1975).

Reference Cited

ELLWOOD, B. B. (1975) Analysis of emplacement mode in basalt from Deep-Sea Drilling Project Holes 319A and 321 using anisotropy of magnetic susceptibility. *Jour. Geophys. Res.*, vol. 80, p. 4805–4808.