

Table 5. XRF analysis of magnetic (Mag.) microspherules from the YDB layers at Blackwater Draw, Gainey, and Morley drumlin

Site-Sample	MgO	Al ₂ O ₃	SiO ₂	CaO	TiO ₂	MnO	FeO	Ni
Blackwater Draw-1	1.9	3.7	5.8	—	13.0	1.7	73.9	—
Blackwater Draw-2	0.8	2.3	3.1	—	53.1	3.5	37.2	—
Gainey-1	—	2.7	5.1	—	—	—	92.2	0.02
Gainey-2	—	24.8	55.0	—	2.0	—	18.2	—
Gainey-3	—	2.9	4.0	—	68.1	0.1	24.9	—
Gainey-4	—	6.4	40.1	21.3	25.4	—	6.9	—
Gainey-5	—	1.9	3.7	—	29.2	1.0	64.2	—
Morley-1	—	2.7	4.5	—	47.3	1.7	43.9	—
Morley-2	1.8	3.0	4.6	—	40.3	—	50.3	—
Morley-3	—	1.7	1.9	—	—	—	84.3	12.1*
Morley-4	—	3.4	11.5	1.3	—	—	83.9	—
Lommel-1	—	—	—	—	74	—	16	—
Lommel-2	—	—	—	—	54	—	11	—
Lommel-3	—	—	—	—	74	—	16	—
Microspherule average	0.4	5.0	12.7	2.1	25.3	0.7	52.7	1.1*
Mag. grains average [†]	1.5	4.7	36	2.1	20.5	1.4	31	0.01
Crustal average (ref. 1)	2.5	15	67	3.6	0.6	0.1	5	0.005

The YDB microspherules are enriched in titanium and comparable to magnetic grains from the Blackwater Draw, Murray Springs, Topper, and Lommel sites. Microspherules and magnetic grains are very similar to each other in composition, suggesting a similar source. On the other hand, both are very different from average crustal abundances. All values are in percentage of total weight with uncertainties of less than $\pm 20\%$.

*The Morley drumlin microspherules were possibly derived from a broad area of ice-sheet melting and the atypically high-Ni concentration may indicate that this spherule does not date to the YDB.

[†] Average of values from Blackwater Draw, Murray Springs, Topper, and Lommel.

1. Rudnick R, Gao R (2003) Vol 3, *Treatise on Geochemistry*, eds Holland H, Turekian K (Elsevier, Oxford),