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Jones, A.P., Kearsley, A., Friend, C.R.L., Robin, E., Beard, A., Tamura, A., Trickett, S., and Claeys, P., 2005, Are there signs of a large Paleocene impact, preserved around Disko Bay, West Greenland?: Nuussuaq spherule beds origin by impact instead of volcanic eruption?, in Kenkemann, T., Hötz, F., and Deutsch, A., eds., Large meteorite impacts III: Geological Society of America Special Paper 384.

TABLE DR1. ITALIAN K-T BOUNDARY IMPACT SPHERULE SPINEL COMPOSITIONS
FOR COMPARISON TO THE PALAEOCENE SPINELS REPORTED BY JONES ET AL. (2005)

Spherule name: S1S1	31	32	33	34	35	36	37	38	39	310	311	312
Wt% oxides												
SiO ₂	0.8	0.9	0.7	1.0	0.6	0.7	0.9	0.8	0.8	0.9	0.7	0.8
TiO ₂	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.3	0.3	0.4	0.3	0.3
Al ₂ O ₃	0.8	1.0	0.7	0.8	0.8	0.7	0.9	0.7	0.8	1.0	0.7	0.8
MgO	1.6	1.5	1.4	1.4	1.8	1.9	1.6	1.7	1.7	1.7	1.7	1.5
V ₂ O ₅	bdl	bdl	0.2	0.1	bdl	bdl	0.1	bdl	bdl	bdl	bdl	0.1
Cr ₂ O ₃	1.4	1.4	1.3	1.3	1.3	1.4	1.4	1.3	1.3	1.3	1.3	1.4
MnO	1.9	1.9	1.9	2.0	1.8	1.9	1.7	1.9	2.0	1.8	1.9	1.9
FeO	69.9	70.8	71.2	71.0	70.3	71.1	70.7	70.1	70.2	69.1	69.6	70.1
CoO	0.5	bdl	0.4	0.5	0.4	0.3	0.3	0.5	0.3	0.5	0.2	0.4
NiO	6.7	6.7	6.8	6.7	6.7	6.8	6.7	6.7	6.9	6.5	6.8	6.7
Na ₂ O	bdl											
K ₂ O	0.1	bdl	bdl	0.1	0.1	bdl	0.1	bdl	bdl	bdl	0.1	bdl
CaO	3.8	3.9	4.2	4.2	4.3	4.1	3.9	3.9	3.9	4.3	4.3	4.2
Total	87.8	88.4	89.2	89.5	88.4	89.2	88.7	87.9	88.2	87.6	87.8	88.2

(continued)

Spherule name: S1S1	41	42	43	44	45	46	47	48	49	410	411	412
Wt% oxides												
SiO ₂	0.2	bdl	bdl	0.3	bdl	bdl	bdl	0.3	0.2	0.2	0.2	0.2
TiO ₂	0.5	0.4	0.4	0.6	0.5	0.4	0.3	0.5	0.4	0.4	0.5	0.5
Al ₂ O ₃	1.5	1.4	1.3	1.5	1.5	1.4	1.5	1.5	1.5	1.5	1.7	1.4
MgO	5.1	5.3	4.9	5.1	5.3	5.1	5.4	5.2	5.1	5.2	5.4	4.8
V ₂ O ₅	bdl	0.1	0.2	bdl	bdl	bdl	bdl	0.1	0.1	0.1	bdl	bdl
Cr ₂ O ₃	0.5	0.5	0.4	0.5	0.4	0.5	0.5	0.4	0.6	0.5	0.4	0.4
MnO	1.5	1.4	1.6	1.4	1.6	1.4	1.5	1.5	1.5	1.4	1.4	1.5
FeO	72.4	72.6	72.5	73.2	72.4	72.7	72.7	72.3	72.8	72.6	72.9	72.4
CoO	0.4	0.4	0.3	0.4	0.3	0.3	0.6	0.4	0.3	0.5	0.4	0.4
NiO	5.5	5.7	5.7	5.4	5.7	5.6	5.4	5.6	5.6	5.6	5.5	5.4
Na ₂ O	bdl											
K ₂ O	bdl	bdl	0.1	bdl	bdl	bdl	0.1	bdl	bdl	bdl	bdl	bdl
CaO	1.1	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.0	1.0	1.1
Total	88.7	88.8	88.5	89.5	88.7	88.6	89.0	88.9	89.1	88.9	89.4	88.2

(continued)

Spherule name: S1S1	51	52	53	54	55	56	57	58	59	510	511	512
Wt% oxides												
SiO ₂	0.2	bdl	0.1	0.2	0.1	0.3	0.2	0.3	bdl	0.3	0.2	0.2
TiO ₂	0.4	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Al ₂ O ₃	3.1	3.2	3.2	3.3	3.1	3.3	3.1	3.3	3.1	3.2	3.1	3.2
MgO	7.4	7.3	7.3	7.5	7.5	7.3	7.4	7.1	7.2	7.1	7.5	7.5
V ₂ O ₅	0.2	bdl	0.1	bdl	bdl	0.2	bdl	0.1	0.1	bdl	0.1	bdl
Cr ₂ O ₃	0.4	0.3	0.3	0.4	0.3	0.4	0.4	0.4	0.3	0.4	0.3	0.4
MnO	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.0	1.1	1.0
FeO	69.3	69.7	68.9	69.1	68.7	68.8	69.5	69.5	69.0	69.3	69.0	68.8
CoO	0.6	0.5	0.6	0.5	bdl	0.3	0.4	0.4	0.4	0.5	0.4	0.4
NiO	5.8	6.0	6.2	6.1	6.3	6.2	6.1	5.9	5.9	5.9	6.0	6.2
Na ₂ O	bdl											
K ₂ O	bdl											
CaO	0.9	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.9	0.7
Total	89.2	89.3	89.1	89.3	88.4	89.0	89.4	89.3	88.3	89.0	89.0	88.8

(continued)

Spherule name: S6		s5sA								
Spectrum name:	ak021031a	ak021031b	ak021031d	ak021031e	ak021126a	ak021126b	ak021126c	ak021126d	ak021126h	ak021126i
Wt% oxides										
SiO ₂	0.5	0.3	0.4	0.3	4.6	bdl	bdl	0.8	0.3	0.2
TiO ₂	0.4	0.3	0.5	0.4	0.5	0.5	0.4	0.6	0.4	0.4
Al ₂ O ₃	0.9	0.7	0.8	0.7	2.7	1.5	1.8	0.8	2.5	1.8
MgO	5.6	7.3	3.1	4.3	3.1	6.4	6.0	2.2	6.7	6.1
V ₂ O ₅	bdl	0.1	bdl	0.1	0.2	bdl	0.2	0.1	0.1	bdl
Cr ₂ O ₃	1.0	0.2	0.2	0.2	1.4	0.5	0.2	0.4	0.6	0.2
MnO	1.6	2.1	2.2	2.2	1.4	1.6	1.8	2.3	1.4	1.9
FeO	71.8	74.9	74.7	75.7	69.8	75.9	77.7	76.0	74.8	76.7
CoO	bdl	bdl	0.4	bdl	bdl	bdl	bdl	bdl	bdl	0.3
NiO	4.0	4.9	3.2	4.0	4.8	5.4	5.7	4.9	6.2	4.7
Na ₂ O	bdl									
K ₂ O	bdl									
CaO	3.6	1.4	1.6	1.3	5.3	1.7	1.3	4.2	1.4	1.7
Total	89.4	92.3	87.1	89.3	93.7	93.5	95.1	92.2	94.4	94.0

(continued)

Spherule name: S6	ak021126j	ak021126k	ak021126m	ak021126n	ak021126o	ak021126q	ak021126r	ak021126s	ak021126t	ak021126u
Wt% oxides										
SiO ₂	bdl	3.0	2.8	0.9	bdl	0.2	0.3	1.5	5.0	1.2
TiO ₂	0.5	0.5	0.6	0.7	0.5	0.4	0.4	0.4	0.4	0.4
Al ₂ O ₃	2.1	1.2	6.7	4.7	4.4	2.0	1.9	1.8	2.5	3.7
MgO	7.8	2.3	11.8	10.3	10.3	7.9	8.9	5.6	6.2	10.3
V ₂ O ₅	bdl	0.2	0.1	0.1	0.1	bdl	0.1	0.2	0.1	0.1
Cr ₂ O ₃	0.3	bdl	0.1	0.3	0.4	0.2	0.2	0.3	0.3	0.6
MnO	1.6	2.5	0.9	0.8	0.8	1.5	1.5	2.0	1.7	1.0
FeO	75.0	77.4	64.1	67.3	69.2	74.1	74.0	71.6	68.8	68.9
CoO	0.2	bdl	bdl	bdl	bdl	0.2	bdl	bdl	bdl	0.2
NiO	4.9	1.2	2.4	6.8	7.4	5.1	5.6	5.1	4.7	6.2
Na ₂ O	bdl									
K ₂ O	bdl									
CaO	1.1	1.0	1.1	1.1	0.9	1.8	1.7	1.3	1.2	1.1
Total	93.5	89.2	90.6	93.1	94.2	93.4	94.6	89.8	90.7	93.9

(continued)

Spherule name: S6

Spectrum name:	ak021126v	ak021126x	ak021126y	ak021126z	ak021126aa	ak021126ac	ak021126ad
Wt% oxides							
SiO ₂	0.3	0.4	1.3	0.4	1.5	bdl	0.3
TiO ₂	0.5	0.4	0.5	0.4	0.4	0.4	0.4
Al ₂ O ₃	2.8	2.6	2.6	1.5	2.0	2.1	0.3
MgO	8.9	8.5	9.2	6.2	8.4	6.5	1.0
V ₂ O ₅	0.2	0.1	0.1	0.1	0.1	bdl	0.1
Cr ₂ O ₃	0.2	0.4	0.2	0.2	0.1	0.2	1.1
MnO	1.1	1.5	1.4	1.8	1.3	1.5	2.0
FeO	71.5	73.9	72.3	77.7	66.7	76.0	80.9
CoO	0.2	bdl	bdl	0.3	bdl	bdl	bdl
NiO	6.0	5.3	5.4	4.1	4.5	4.8	4.3
Na ₂ O	bdl	bdl	bdl	bdl	bdl	bdl	bdl
K ₂ O	bdl	bdl	bdl	bdl	bdl	bdl	bdl
CaO	1.3	1.1	1.2	1.2	1.1	1.5	2.2
Total	92.9	94.3	94.1	93.9	86.3	93.0	92.6

(continued)

<u>Spherule name: s1s1</u>										
Spectrum name:	ak020521d	ak020521e	ak020521f	spin3	spin6	spin7	spin8	spin9	spin10	bright grain
Wt% oxides										angular
SiO ₂	1.1	0.3	1.8	0.5	bdl	0.2	0.3	0.3	1.7	0.3
TiO ₂	0.6	0.5	0.4	0.4	0.5	0.4	0.4	0.6	0.7	0.4
Al ₂ O ₃	7.4	1.7	1.5	0.9	3.0	3.6	3.8	3.5	4.7	0.4
MgO	14.2	6.6	1.9	2.9	9.8	10.3	11.0	10.7	14.1	4.0
V ₂ O ₅	bdl	bdl	bdl	0.1	bdl	bdl	0.1	0.1	0.1	bright grain
Cr ₂ O ₃	0.4	0.5	1.5	0.2	0.4	0.4	0.3	0.3	0.7	0.3
MnO	0.6	1.6	1.9	2.3	0.7	0.7	0.8	1.1	1.3	2.6
FeO	65.8	74.9	71.5	75.0	66.9	67.5	68.8	67.0	63.0	76.9
CoO	0.3	0.5	0.4	0.4	0.4	0.3	0.4	0.3	0.3	0.4
NiO	4.3	5.8	6.9	3.7	4.9	5.2	5.4	5.0	4.5	4.1
Na ₂ O	bdl	bdl	bdl	0.3	bdl	bdl	bdl	bdl	0.7	bdl
K ₂ O	0.1	bdl	0.1	bdl	bdl	bdl	bdl	0.1	0.1	bdl
CaO	0.7	1.1	3.8	1.1	0.9	0.8	1.0	1.2	2.4	1.2
Total	95.5	93.5	91.5	87.9	87.5	89.5	92.3	90.0	93.5	91.3
										92.7

(continued)

Spherule name: s1s1

Spectrum name:	centre	spade	tiny Cr	ak021220q
Wt% oxides				
SiO ₂	0.5	3.2	0.2	1.1
TiO ₂	0.6	0.8	0.5	0.6
Al ₂ O ₃	2.5	6.6	2.0	1.0
MgO	6.9	12.1	5.9	1.2
V ₂ O ₅	bdl	0.2	bdl	0.1
Cr ₂ O ₃	0.5	0.3	0.4	1.4
MnO	1.4	0.5	1.4	2.8
FeO	74.5	60.7	72.7	71.4
CoO	bdl	0.4	0.4	0.4
NiO	4.2	4.4	5.7	6.6
Na ₂ O	bdl	bdl	bdl	bdl
K ₂ O	bdl	0.2	bdl	0.1
CaO	1.7	0.6	1.0	4.7
Total	92.8	89.9	90.1	90.5
				93.0

Note: (1) All analyses performed by energy dispersive X-ray microanalysis using Oxford Instruments exL EDS on JEOL 840 scanning electron microscope at Oxford Brookes University.

(2) Analyses were performed with an accelerating voltage of 20keV, beam current of 2nA, and X-ray acquisition for 100 seconds livetime at process time 5. The detector take-off angle was 40 degrees and a beryllium window was employed. Matrix correction employed the ZAF4 routine of Oxford Instruments.

(3) Quantitative analysis standards were: Si from synthetic fayalite; Ti from rutile; Al from synthetic alumina; Mg from periclase; Fe from synthetic fayalite, V, Cr, Mn, Co and Ni from high purity metals, Na from jadeite, K from orthoclase and Ca from wollastonite. All standards were part of the main suite at Oxford Brookes University and are now in the Department of Mineralogy at the Natural History Museum, London.

(4) "bdl" refers to below detection level by this analysis method.

(5) All spinel-bearing spherules were in an impure limestone matrix, so CaO may reflect very fine carbonate cement infiltration into spherule, between finer grains, and high potassium may reflect finely intergrown green phyllosilicate replacing mafic glass.

(6) Throughout these analyses, all Fe is expressed as Fe²⁺. The analysis shortfall from 100% represents oxygen for Fe³⁺ in spinel B site.