

**Microkrystites and (micro)tektites at the KT boundary: Two different sources or one?** J. Smit<sup>1</sup>, A. Montanari<sup>2</sup>, W. Alvarez<sup>2</sup>. <sup>1</sup>Dept. Sediment. Geol., Free Univ., PO BOX 7161, 1007MC, Amsterdam; <sup>2</sup>Dept. Geology & Geophysics, Univ. Calif., Berkeley 94720

At the KT boundary occur two basically different types of impact ejecta spherules, which occur in two different strewnfields. The first type consist of -mostly altered- microkrystites (crystallite bearing glass spherules) distributed in a worldwide strewnfield. The second type consist of (micro) tektites, also usually altered, occurring in a strewnfield in and close to North America. In the Beloc site, Haiti, original tektite glass is still preserved in the cores of the tektites<sup>1</sup>

The crystallites in the KT microkrystites are almost everywhere completely altered to other minerals, which differ depending on the local diagenetic environment (k-spar, smectite/glaucanite, pyrite), but all retain the original crystal texture. No glass has survived, but at most locations (Spain, Italy, south Atlantic, Pacific) skeletal magnesioferrite spinels<sup>2</sup> have survived alteration, and in one locality (DSDP site 577 in the Pacific) finely dendritic clinopyroxene has survived in some of the KT micro- krystites. The dendritic texture in all altered KT microkrystites is identical to the texture of the cpx spherules<sup>3</sup>. The KT microkrystites are smaller (~200 $\mu$ ) than the KT (micro)tektites (>1mm). If not deformed, the microkrystites show only (sub)spherical forms, though frequently 2 or more spheres are fused together. This is in contrast with the abundant splash-forms and rotational forms with flow lines found in the KT tektite strewnfield. Cpx (table1,a,b) is a mineral which 'scavenges' elements from the melt if it has grown quickly, and its composition pretty much reflects the composition of the melt. In MOR-basalts, both dendritic cpx and host-glass have been analysed (Table1, c, d)<sup>4</sup>, and from these analyses we can infer the partitioning of the different elements between the melt and the growing cpx crystals. So in the absence of any remaining glass, we still have a reasonable estimate of the original melt composition of the microkrystites (table1, e). This inferred melt is different from the composition of the Haiti KT tektite glass (table1, f,g)<sup>1</sup>. The total abundance of microkrystites is large. In the impact layer in the Tetri-Tskaro KT-site, Georgia, USSR, altered, but not deformed microkrystites form an air-fall deposited graded layer of 8 spherules thick. The grading is due to differential settling, because if the grading were due to current size-sorting, the abundantly available foraminifera of the same size should be present in the layer too, which is not the case. The abundance in Tetri-Tskaro is some 14,000 microkrystites/cm<sup>2</sup>. At other sites, the abundance of microkrystites has earlier been underestimated, because most microkrystites have been deformed, and are spread by bioturbation. A re-examination of the Caravaca, Agost, and DSDP 577 sites, show a similar abundance of microkrystites (>10,000/cm<sup>2</sup>). Assuming the strewnfield extends around half the globe, some 1500 km<sup>3</sup> of basaltic rock has been ejected in the form of spherules. KT (micro)tektites are significantly larger than KT microkrystites and never show any evidence of (relict)internal crystallites. Bubble-cavities are observed at all locations, and frequently flow-lines, indicating domains of different compositions, are etched out on the surface<sup>5</sup>. Dumbbell and droplet shapes are common, as are erratic stretched-out rotational forms. The KT tektites occur in DSDP sites 390a, 603<sup>6</sup>, Dogie Creek/Teapot Dome Wyoming<sup>7</sup>, Mesa de Llera, Mexico, and Beloc, Haiti<sup>8</sup>.(fig.) The different compositions of the microkrystites and microtektites may be explained by different impact target rocks, ocean basalts for microkrystites, and continental rocks for the tektites. On the other hand the KT tektite and KT microkrystite strewnfields do not overlap. The microkrystites are enriched in Ir<sup>2</sup>, but the tektites apparently not. Thus it can also be argued that the microkrystites are formed from the high-energy ejecta-cloud by condensation, but that the KT microtektites never were vaporized, remained molten and therefore show rotational splashforms.

The tektites are thus representative for the impact target rocks, but the microkrystites may be condensed from the target rock plus a significant amount of the bolide itself. This is consistent with the differences in the melt compositions of the microkrystites and tektites (table 1, e, f, g). The high Fe, Mg, Ir content may be due to contribution from the bolide, and the high Ca in the cpx from a carbonate target-rock component, such as at the possible Chicxulub impact site.

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	a	b	c	d	e	f	g
	cpx577	cpx577	picr.	MOR-basalt.	cpx577	Haiti	Haiti
	coarse	fine	cpx	glass	"glass"	glass	Hi-Ca Glass
SiO <sub>2</sub>	46.95	45.30	48.85	49.62	46.01	63.09	44.44
P <sub>2</sub> O <sub>5</sub>	0.82	0.20					
Al <sub>2</sub> O <sub>3</sub>	3.95	6.10	6.48	14.04	13.22	15.21	11.72
TiO <sub>2</sub>	0.34	0.37	0.81	0.96	0.44	0.67	0.66
Cr <sub>2</sub> O <sub>3</sub>	0.13	0.13	0.34	0.08	0.03		
FeO	10.89	10.60	5.34	9.32	17.09	5.44	4.8
MnO	0.09	0.06	0.22	0.18	0.05	0.14	0.1
MgO	11.85	11.10	15.22	9.35	6.82	2.74	4.41
NiO	0.65	0.52			0.16		
CaO	23.03	23.40	21.34	12.41	13.61	7.26	30.71
Na <sub>2</sub> O	0.88	0.43	0.19	1.53	1.29	3.63	2.01
K <sub>2</sub> O				0.07		1.59	0.48
total	99.59	98.08	98.79	97.48	98.71	99.76	99.32

