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Raspite is the name given to the monoclinic dimorph of lead tungstate (Pb WO4), which is found principally as the tetragonal mineral stolzite. The existence of the two forms was first recorded in 1897 when brown longitudinally striated monoclinic prisms were found in association with normal stolzite on cellular manganiferous gossan from Broken Hill, New South Wales, Australia.(1) The new form of lead tungstate was named raspite after Charles Rasp, who was one of the discoverers of the Broken Hill silver-lead-zinc lode.

Virtually all the specimens of raspite held in collections throughout the world have come from Broken Hill, where it was very rare; even stolzite was not abundant. Dana's System of Mineralogy also reports its presence in Mexico and Brazil(2), but neither locality has produced any appreciable quantity of specimens. Efforts to synthesize raspite have not been successful(3), so that although it is of obvious secondary origin, being produced under near-surface conditions of supergene leaching, the factors which determine that it shall form in preference to stolzite are still unknown. The scarcity of raspite and its very restricted occurrence suggest an unusual set of genetic conditions.

The discovery of raspite at a second locality only 600 km east of Broken Hill is therefore quite surprising. The Cordillera Mine (Lat. 34°05'S, Long. 149°24'E) is one of many minor metalliferous

lodes of the hydrothermal fissure-filling type which were briefly worked in Australia near the beginning of this century (Photograph 1). The lode was worked over a length of approximately 200 metres, with most mining activity restricted to the silver-rich zone of oxidation and secondary enrichment in the upper 40 to 50 metres. The vein has a general north-south strike parallel to local geological trends and dips almost vertically. The host rocks are volcanigenic shale, slate, and greywacke belonging to the Kangaloolah Volcanics group, which is of lower Silurian age (Geol. Surv. N.S.W., Goulburn 1:250 000 Geological Sheet).

Previous authors[4] noted the presence of tungsten mineralisation at the Cordillera Mine and recorded the minerals scheelite, cuproscheelite, stolzite, and cuprotungstite (Cu_2 (WO4) (OH_2)), and the more common oxidation products of a copper-lead orebody: cerussite, anglesite, azurite, and malachite. Another unusual secondary mineral found during present investigations is a pale yellow osarizawaite $(Pb, Cu)_2\ Al_3\ (SO_4)_2\ (OH)_6$ of earthy habit.

The finer raspite crystals occur prominently on kernels of relict scheelite, and more coarse crystals in cavities within cellular limonite-quartz gossan. So far, these have only been found in one small residual dump of oxidized ore close to the former lode outcrop. The crystals are generally flat single prisms up to 5 mm long and 2 mm wide. They show the distinctive monoclinic habit with 100, 011, 001, and 101 forms commonly developed. They are strongly striated parallel to their elongation in the 010 direction. Twinning on the 100 plane is very common. Some specimens are slightly divergent sheaf-like aggregates (photograph II). The coarser crystals are pale yellow-brown, while the finer aggregates intergrown with stolzite, cuprotungstite and various limonitic oxides, range in colour from

pinkish brown to colourless. The raspite and stolzite crystals seem to crystallize freely in conjunction (photograph III) and in a few cases have ultrafine mimetite prisms scattered over their surfaces.

The Cordillera raspite shows a wider range of colours than the rather uniformly brownish material which is typical at Broken Hill. Trace element chemical analysis is also distinctive, as recorded in the following table(i):-

Table (i): Spectrographic trace chemical analysis of raspites (in parts per million)

ELEMENT	Cordillera Mine Raspite	Broken Hill Raspite
Antimony	nil	200
Arsenic	nil	nil
Barium	nil	nil
Calcium	50	100
Chromium	nil	30
Cobalt	nil	nil
Copper	800	400
Iron	3000	200
Manganese	10	200
Molybdenum	nil	25
Silver	20	10
Strontium	30	30
Vanadium	nil	600

X-ray diffractometer data for raspite from Broken Hill and Cordillera mines are set out in Table (ii) together with ASTM data.

Table (ii): X-ray diffraction data on raspites

Cordillera		A.S.T.M.		Broken Hill	
dÅ	100I/Io	dÅ	100I/Io	dÅ	100I/Io
6.46	11	6.43	16	6.46	8
5.29	5	5.27	4	5.31	4
4.90	4	4.87	4		
4.65	3				
3.99	1	3.999	2		
3.71	1			3.72	2
3.63	100	3.619	55	3.63	100
		3.593	20		
3.49	42	3.478	20	3.49	50
3.23	100	3.224	100	3.23	100
2.91	35	2.910	20	2.92	42
2.76	39	2.76	60	2.76	37
2.71	100	2.705	55	2.71	93
2.65	2				
2.49	18	2.484	10	2.49	25
2.44	18	2.444	16	2.45	17
2.34	3	2.342	2	2.35	6
				2.32	3
2.24	18	2.245	4		
2.23	12	2.223	20	2.23	19
2.19	5	2.194	8	2.20	21
2.16	4			2.17	7
2.11	4	2.108	2	2.11	7
2.03	20	2.030	18	2.03	26
1.99	5			1.99	3
1.97	20	1.971	14	1.97	29
1.92	1	1.929	2	1.93	3
1.89	2	1.897	2	1.90	2
1.85	26	1.848	16	1.85	45
1.82	25	1.812	25	1.81	21
1.79	3	1.793	2	1.79	3
				1.77	3
1.74	14	1.736	14	1.74	20
1.69	16	1.694	20	1.70	19
1.67					

1.66	7	1.660	4	1.66	13
1.63	4	1.629	8	1.63	5
1.58	6	1.585	4	1.59	9
1.55	7	1.548	4	1.55	12
1.54	19	1.536	14	1.54	27
1.51	3	1.505	2	1.51	5
1.48	5	1.474	2	1.47	8
1.46	5	1.466	4	1.46	7

Although the outcrop of the Cordillera lode is obscured by surface slumping due to collapse of the underground workings, it appears that the tungsten and copper-lead bearing lodes were separate but very near each other - so near that the former fall within the aureole of ~~supreme~~ supergene copper- and lead-bearing solutions which reacted with the scheelite and by cationic exchange formed the copper and lead tungstates. No reaction between the primary minerals has been found.

Why the monoclinic form of lead tungstate should develop at so few of the stolzite localities still remains a problem, if anything emphasized by their intimate intergrowth in single specimens from both Cordillera and Broken Hill. The only possibility which arises from investigation of these two occurrences appears to be that of an obscure geochemical factor developed during oxidation and leaching.

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Photograph I. General view of the Cordillera mine dump and old smelter stack, New South Wales, Australia.

Photograph II. Cluster of raspite prisms on fine stalactitic limonite gossan, Cordillera Mine, New South Wales, Australia. (Magnified 10x).

Photograph III. Cluster of raspite prisms with bipyramidal stolzite and very fine mimetite on limonitic gossan. Cordillera Mine, New South Wales, Australia. (Magnified 40x).