THE OCCURRENCE OF TEINEITE FROM THE KAWAZU (RENDAIJI) MINE, SHIZUOKA PREFECTURE, JAPAN

AKIRA KATO

*Division of Mineralogy, Smithsonian Institution, U. S. National Museum,
Washington, D. C. U. S. A.*

and

KIN-ICHI SAKURAI

*Department of Geology, National Science Museum,
Ueno, Tokyo, Japan*

ABSTRACT

Teineite from the new locality, Kawazu mine, Shizuoka Prefecture, Japan, is described and its relation to an associating but unidentified copper-tellurium sulphide is discussed.

Teineite, $\text{CuTeO}_3 \cdot 2\text{H}_2\text{O}$, a rare secondary mineral only known from the original locality, Teine mine, Hokkaido (Yoshimura (1936)), was found from the Kawazu (Rendaiji) mine, Shizuoka prefecture, Japan.

The ore deposits of the Kawazu (Rendaiji) mine consist of epithermal veins cutting altered Neogene pyroclastic rocks (Kato, Shibata and Nakamoto (1933)), and had been worked for gold and silver till 1963. The veins are classified into two kinds according to the nature of ores, that is, one gold-silver-tellurium-bearing quartz vein and some gold-silver-copper-zinc-lead-bearing quartz veins with a very small amount of tellurium in which the studied material was found. From the former, the occurrences of tellurium (Watanabe (1936)), rickardite

(Watanabe (1934)), hessite, enpressite and stuetzite (Takasu (1965)), tellurite (Kato, Shibata and Nakamoto (1933)), paratellurite (Sakurai and Kato (1965a)) and spiroffite (Sakurai and Kato (1965b)) are known, and those of chalcopyrite, sphalerite, galena, electrum, argentite and tetrahedrite (Kato, Shibata and Nakamoto (1933)), an unnamed copper-tellurium-sulphide mineral (cubic, $a_0=10.26\text{\AA}$, with tetrahedrite-type X-ray powder pattern), inesite (Kato (1930)), and johannsenite (Sakurai and Kato (unpublished)) from the latter. The specimen studied was collected by the second author about thirty years ago. It is a very small piece of gray-black ore with drusy parts surrounded by minute rock crystals on which an azure-blue bundle of teineite up to about $1\times 1\times 2$ mm. in size is present. The gray black part consists of minute aggregate of pyrite, the above-mentioned copper-tellurium-sulphide mineral and quartz. The drusy parts are locally rimmed by light green colour due to dissemination of very minute brochantite grains, which form in places tiny mammillary aggregates less than 0.5 mm. in diameter. The teineite bundle is isolated from these aggregates and composed of aggregates of long to short prismatic crystals with rugged faces. Part of the prisms is superficially covered with a blue green undeterminable alteration product.

Since the amount of specimen available for the determination was very small, the X-ray powder and fluorescent studies were made. The X-ray powder data are virtually identical with those by Mandarino (1964), and Uetani, Kato and Imayoshi (1965), except a few unindexed diffraction lines ($d=4.53$, 3.81 and $1.547\text{\AA}$) probably due to the contaminative alteration product, which could not be identified by the A. S. T. M. Card File (Table 1). From the indexing, the unit cell constants are calculated as $a_0=6.63_1\text{\AA}$, $b_0=9.60_1\text{\AA}$, $c_0=7.43_0\text{\AA}$. The X-ray fluorescent analysis gave the presence of copper and tellurium as the major constituents.

It is worth mentioning that teineite from the original locality is found in druses of tellurium-barite ore virtually void of significant

Table 1. X-ray powder data for teineites from the Teine mine, Hokkaido and the Kawazu (Rendaiji) mine, Shizuoka prefecture, Japan

1.		2.				
$d(\text{\AA})$	I	$d(\text{\AA})$	I	$Q_{obs.}$	$Q_{calc.}$	hkl
5.90	25	5.89	30	0.030	0.029	011
5.47	100	5.43	100	0.034	0.034	110
4.96	45	4.95	30	0.041	0.041	101
4.77	2					020
		4.53	5			
4.41	15	4.40	20	0.052	0.052	111
4.04	2	4.04	5	0.061	0.062	021
3.89	10	3.89	10	0.066	0.066	120
		3.81	5			
3.72	5	3.70	10	0.073	0.073	002
3.45	100	3.44	100	0.085	0.083	012
					0.084	121
3.32	10	3.31	5	0.091	0.091	200
3.24	5	3.24	5	0.095	0.095	102
3.14	10	3.13	10	0.102	0.102	210
3.07	55	3.07	60	0.106	0.106	112
2.940	25	2.94	60	0.116	0.116	031
					0.116	022
2.890	50	2.89	60	0.120	0.120	211
					0.121	130
2.730	10	2.73	10	0.134	0.135	220
2.687	20	2.68	20	0.139	0.139	131
					0.139	122
2.564	30	2.56	20	0.153	0.153	221
2.477	15	2.47	10	0.164	0.164	202
2.400	35	2.40	40	0.174	0.174	040
					0.174	013
2.279	2	2.28	10	0.193	0.192	041
					0.193	132
2.259	1	2.26	10	0.196	0.195	140
					0.197	113
2.204	15	2.20	20	0.207	0.206	023

					0.207	231
					0.207	222
2.158	10	2.16	10	0.214	0.215	141
					0.216	310
2.125	2					301
2.091	20	2.09	30	0.229	0.229	123
2.074	5	2.07	10	0.233	0.234	311
2.013	25	2.01	20	0.248	0.246	042
					0.249	320
		1.984	5	0.2541	0.2542	203
1.960	10	1.959	10	0.2606	0.2607	033
					0.2614	232
1.943	1	1.940	10	0.2657	0.2648	240
					0.2650	213
					0.2667	321
1.884	5	1.881	10	0.2826	0.2829	241
					0.2835	133
1.865	5	1.862	10	0.2884	0.2886	312
					0.2894	051
1.858	5				0.2898	004
		1.844	5	0.2817	0.2829	241
1.823	2	1.818	10	0.3026	0.3029	330
1.795	5	1.789	5	0.3125	0.3122	151
					0.3126	104
1.758	5	1.760	10	0.3228	0.3235	114
1.725	15	1.723	20	0.3368	0.3366	043
					0.3373	242
1.688	5	1.688	10	0.3510	0.3519	233
1.669	5	1.670	5	0.3586	0.3594	143
1.660	5				0.3648	400
1.652	10	1.622	10	0.3801	0.3788	340
					0.3791	313
					0.3810	204
1.601	2	1.600	5	0.3906	0.3906	060
					0.3919	214
1.561	2	1.561	10	0.4104	0.4103	134
					0.4116	323

1. 531	5	1. 547	5			
		1. 531	10	0. 4268	0. 4273	421
					0. 4278	243
		1. 512	10b	0. 4374	0. 4373	402
1. 499	2	1. 492	5	0. 4492	0. 4482	412
					0. 4498	071
1. 470	5	1. 469	10	0. 4634	0. 4631	062
					0. 4634	044
					0. 4637	015
1. 447	5	1. 446	10	0. 4783	0. 4787	234
		1. 431	5	0. 4883	0. 4865	115
		1. 423	5	0. 4939	0. 4946	351
		1. 389	5	0. 5183	0. 5190	125
1. 367	10	1. 365	10	0. 5367	0. 5384	440
1. 344	5	1. 343	10	0. 5544	0. 5536	063
					0. 5543	262
					0. 5547	244
					0. 5550	215
$a_0=6.639\text{\AA}$		$a_0=6.63_1\pm0.005\text{\AA}$				
$b_0=9.606\text{\AA}$		$b_0=9.60_1\pm0.005\text{\AA}$				
$c_0=7.432\text{\AA}$		$c_0=7.43_0\pm0.005\text{\AA}$				

1. Teineite. Teine mine, Hokkaido, Japan. Cu/Ni radiation. Intensities were measured on diffractometer scale. After Uetani, Kato and Imayoshi (1965).
2. Teineite. Kawazu mine, Shizuoka prefecture, Japan. Cu/Ni radiation. Camera diam. 114.59 mm. Intensities were estimated visually. b=broad.

copper mineral. Hence, the copper is considered to have been derived from other sources somewhat distant from the site of its formation. While for the present specimen, the presence of a copper-tellurium mineral close to it suggests itself to be the direct source of copper and tellurium provided that this teineite is of secondary origin.

Though we have not succeeded to accumulate much material to explain the rarity of this mineral, the present study suggests that the copper-tellurium-sulphide mineral may be the direct source of

this teineite under such an appropriate condition as copper behaves as divalent copper ion and tellurium takes the form of TeO_3^{-2} ion.

This work was done while one of the authors (A. K.) was at the Division of Mineralogy, Smithsonian Institution, U. S. National Museum as a Postdoctoral Research Associate sponsored by the National Research Council, U. S. A.

REFERENCES

- KATO, T. (1930). *J. Geol. Soc. Japan*, **37**, 35-38 (in Japanese).
KATO, T., SHIBATA, H. & NAKAMOTO, A. (1933). *J. Geol. Soc. Japan*, **40**, 233-241 (in Japanese).
MANDARINO, J. A. (1964). *Amer. Min.*, **49**, 1461-1485.
SAKURAI, K. & KATO, A. (1965a). *J. Miner. Soc. Japan*, **7**, 346-348 (in Japanese).
SAKURAI, K. & KATO, A. (1965b). *J. Miner. Soc. Japan*, **7**, 348-350 (in Japanese).
TAKASU, S. (1965). *J. Miner. Soc. Japan*, **7**, 350-355 (in Japanese).
UETANI, K., KATO, A. & IMAYOSHI, T. (1965). *Bull. Nat. Sci. Mus. Tokyo*, **8**, 95-97.
WATANABE, M. (1934). *J. Jap. Assoc. Miner. Petro. Econ. Geol.*, **12**, 89-96 (in Japanese).
WATANABE, T. (1936). *J. Fac. Sci. Hokkaido Univ. Ser. IV*, **3**, 101-111.
YOSHIMURA, T. (1936). *J. Jap. Assoc. Miner. Petro. Econ. Geol.*, **16**, 225-234 (in Japanese).

Manuscript received 13 December 1967.