Kesterite $Cu_2(Zn, Fe)SnS_4$

Crystal Data: Tetragonal, pseudocubic. *Point Group:* $\overline{4}$. Massive.

Physical Properties: Hardness = 4.5 VHN = 328–348 (100 g load). D(meas.) = 4.54–4.59 D(calc.) = 4.524

Optical Properties: Opaque. *Color:* Greenish black. *Streak:* Black. *Luster:* Metallic. R_1–R_2: (400) 23.7–24.5, (420) 24.4–25.2, (440) 24.9–25.8, (460) 25.4–26.0, (480) 25.6–26.0, (500) 25.6–25.9, (520) 25.2–25.7, (540) 24.9–25.6, (560) 24.6–25.5, (580) 24.5–25.5, (600) 24.4–25.4, (620) 24.3–25.3, (640) 24.2–25.1, (660) 24.2–25.1, (680) 24.3–25.2, (700) 24.6–25.4

Cell Data: *Space Group:* $I\overline{4}$. $a = 5.427$ $c = 10.871$ Z = 2

X-ray Powder Pattern: Kester deposit, Russia.
3.15 (100), 1.929 (70), 1.645 (50), 1.113 (40), 2.73 (30), 1.248 (30), 0.860 (30)

Chemistry:

	(1)	(2)
Cu	30.56	29.40
Zn	11.16	10.18
Fe	1.68	3.12
Sn	25.25	28.07
S	28.40	29.19
rem.	0.98	
Total	98.03	99.96

(1) Kester deposit, Russia; remainder Mn 0.07%, Sb 0.90%, Se 0.01%; corresponding to $Cu_{2.17}(Zn_{0.77}Fe_{0.14})_{\Sigma=0.91}Sn_{0.96}S_{4.00}$. (2) St. Michael's Mount, England; by electron microprobe corresponding to $Cu_{2.03}(Zn_{0.68}Fe_{0.24})_{\Sigma=0.92}Sn_{1.04}S_{4.00}$.

Occurrence: In quartz-sulfide hydrothermal veinlets in tin deposits.

Association: Arsenopyrite, stannoidite, chalcopyrite, chalcocite, sphalerite, tennantite.

Distribution: From the Kester deposit, Arga-Ynnakh-Khai granite massif, Yana-Adycha River region, Sakha, Russia [TL]. In the Kochbulak gold deposit, Chatkal-Kuramin Mountains, eastern Uzbekistan. From the Dachang district, Guangxi Autonomous Region, China. In the Ikuno mine, Hyogo Prefecture, and the Toyoha mine, Hokkaido, Japan. At Cínovec (Zinnwald), Czech Republic. From St. Michael's Mount, Marazion, and in the Cligga mine, Perranzabuloe, Cornwall, England. From Chizeuil, Saône-et-Loire, France. At Kirki, Thrace, Greece. In Canada, from the Snowflake mine, Revelstoke mining division, British Columbia; at the Brunswick tin mine, 55 km southwest of Fredericton, New Brunswick; and in the Kidd Creek mine, near Timmins, Ontario. In the USA, from the Hugo mine and in the Peerless pegmatite, near Keystone, Pennington Co., South Dakota; at the Cove mine, McCoy district, Lander Co., Nevada; in the Campbell mine, Bisbee, Cochise Co., Arizona. From the Pirquitas deposit, Riconada Department, Jujuy Province, Argentina. At Oruro, Bolivia. A few other minor occurrences are known.

Name: For the locality in Russia at the Kester deposit.

Type Material: Mineralogical Museum, St. Petersburg University, 16188, 16324–16326, 16351, 16352; Mining Institute, St. Petersburg, Russia, 163a/2.

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Can. Mineral., 17, 125–135. (5) Moore, F. and R.A. Howie (1984) Tin-bearing sulphides from St Michael's Mount and Cligga Head, Cornwall. Mineral. Mag., 48, 389–396. (6) Bonazzi, P., L. Bindi, G.P. Bernardini, and S. Menchetti (2003) A model for the mechanism of incorporation of Cu, Fe and Zn in the stannite-këesterite series, Cu_2FeSnS_4–Cu_2ZnSnS_4. Can. Mineral., 41, 639–649. (7) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 283. (8) Pekov, I.V. (1998) Minerals first discovered on the territory of the former Soviet Union. Ocean Pictures, Moscow, 113.