Hashemite $Ba(Cr,S)O_4$

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. As stubby doubly-terminated to tabular crystals, to 1 mm, showing {100}, {110}, {010}, {001}, and a number of other forms.

Physical Properties: *Cleavage:* {001}, perfect; {010}, {100}, good. Hardness = 3.5 D(meas.) = 4.54–4.59 D(calc.) = 4.46–4.52

Optical Properties: Semitransparent. *Color:* Brown, crystals typically zoned from pale yellowish brown to darker greenish brown in the core. *Luster:* Adamantine.
Optical Class: Biaxial (+). *Dispersion:* $r < v$, extreme. $\alpha = 1.810–1.952$ $\beta = 1.813–1.960$ $\gamma = 1.824–1.977$ 2V(meas.) = 35°–57° 2V(calc.) = 55°–69°

Cell Data: *Space Group: Pnma.* $a = 9.1028(14)$ $b = 5.5276(7)$ $c = 7.3314(11)$ $Z = 4$

X-ray Powder Pattern: Jordan.
3.516 (100), 3.171 (80), 3.669 (60), 2.175 (45), 2.150 (45), 2.770 (40), 3.403 (35)

Chemistry:

	(1)	(2)
SO_3	2.18	11.75
CrO_3	37.0	26.15
BaO	60.8	62.55
Total	99.98	100.45

(1) Jordan; by electron microprobe, average of five analyses of dark crystals; corresponding to $Ba_{1.00}(Cr_{0.93}S_{0.07})_{\Sigma=1.00}O_4$. (2) Jordan; by electron microprobe, average of four analyses of pale crystals; corresponding to $Ba_{1.00}(Cr_{0.64}S_{0.36})_{\Sigma=1.00}O_4$.

Mineral Group: Barite group.

Occurrence: Disseminated in veinlets cutting phosphate carbonate rock, the stratigraphic correlative of the Mottled Zone of the Hatrurim Formation, Israel.

Association: Chromian ettringite, apatite, bultfonteinite, calcite.

Distribution: From stone quarries 60 km southeast of Amman, west-central Jordan.

Name: Honors the Hashemite Kingdom of Jordan, within which the species occurs.

Type Material: National Museum of Natural History, Washington, D.C., USA, 146183.

References: (1) Hauff, P.L., E.E. Foord, S. Rosenblum, and W. Hakki (1983) Hashemite, $Ba(Cr,S)O_4$, a new mineral from Jordan. Amer. Mineral., 68, 1223–1225. (2) Duesler, E.N. and E.E. Foord (1986) Crystal structure of hashemite, $BaCrO_4$, a barite structure type. Amer. Mineral., 71, 1217–1220. (3) Pasero, M. and P. Davoli (1987) Structure of hashemite, $Ba(Cr,S)O_4$. Acta Cryst., C43, 1467–1469.