

**Crystal Data:** Cubic. *Point Group:*  $4/m\bar{3}2/m$ . Crystals octahedral, modified by the cube or dodecahedron, to 1.6 cm; commonly fine granular, compact, massive. *Twinning:* On {111} as both twin and composition plane, the spinel law.

**Physical Properties:** *Cleavage:* Parting may develop along {111}. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 5.5 VHN = 1278–1456 (100 g load). D(meas.) = 4.5–4.8 D(calc.) = [5.12] Some samples are weakly magnetic.

**Optical Properties:** Translucent to opaque. *Color:* Black to brownish black; brown to brownish black on thin edges in transmitted light; in reflected light, gray-white with a brownish tint and brownish red internal reflections. *Streak:* Brown. *Luster:* Metallic to submetallic.

*Optical Class:* Isotropic.  $n = 2.08\text{--}2.16$

R: (400) 13.2, (420) 13.1, (440) 13.0, (460) 12.8, (480) 12.6, (500) 12.4, (520) 12.2, (540) 12.0, (560) 11.9, (580) 11.8, (600) 11.7, (620) 11.7, (640) 11.6, (660) 11.6, (680) 11.6, (700) 11.6

**Cell Data:** *Space Group:*  $Fd\bar{3}m$  (synthetic).  $a = 8.344$   $Z = 8$

**X-ray Powder Pattern:** Zimbabwe.

2.499 (10), 1.592 (9), 1.461 (9), 2.070 (7), 2.93 (6), 1.079 (6), 0.846 (6)

<b>Chemistry:</b>	(1)	(2)	(3)	(1)	(2)	(3)	
TiO <sub>2</sub>	0.26	0.27		FeO	25.48	19.63	32.10
Al <sub>2</sub> O <sub>3</sub>	9.89	12.47		MnO		0.44	
Fe <sub>2</sub> O <sub>3</sub>	5.88	1.29		NiO		0.06	
Cr <sub>2</sub> O <sub>3</sub>	52.17	56.78	67.90	MgO	5.28	9.29	
V <sub>2</sub> O <sub>3</sub>	0.28			Total	99.24	100.23	100.00

(1) Bushveld complex, South Africa; by electron microprobe, Fe<sub>2</sub>O<sub>3</sub> calculated from stoichiometry; corresponds to (Fe<sub>0.74</sub><sup>2+</sup>Mg<sub>0.27</sub>)<sub>Σ=1.01</sub>(Cr<sub>1.42</sub>Al<sub>0.40</sub>Fe<sub>0.15</sub><sup>3+</sup>Ti<sub>0.01</sub>V<sub>0.01</sub>)<sub>Σ=1.99</sub>O<sub>4</sub>. (2) Great Dyke, Zimbabwe; by electron microprobe, Fe<sub>2</sub>O<sub>3</sub> calculated from stoichiometry; corresponds to (Fe<sub>0.54</sub><sup>2+</sup>Mg<sub>0.45</sub>Mn<sub>0.01</sub>)<sub>Σ=1.00</sub>(Cr<sub>1.47</sub>Al<sub>0.48</sub>Fe<sub>0.03</sub><sup>3+</sup>Ti<sub>0.01</sub>)<sub>Σ=1.99</sub>O<sub>4</sub>. (3) FeCr<sub>2</sub>O<sub>4</sub>.

**Polymorphism & Series:** Forms series with magnesiochromite and hercynite.

**Mineral Group:** Spinel group.

**Occurrence:** A cumulus mineral in ultramafic portions of layered mafic igneous rocks; an accessory mineral in alpine-type peridotites; also detrital. Common in all meteorites, except carbonaceous chondrites, and in lunar mare basalts.

**Association:** Olivine, enstatite, plagioclase, serpentine, magnetite, ilmenite, pyrrhotite, pentlandite, ulvöspinel.

**Distribution:** Widespread. From Gassin, Var, France. Large crystals from Hangha, Sierra Leone. At Tiebaghi, New Caledonia. As economic deposits in: the Bushveld complex, Transvaal, South Africa. From the Great Dyke, Zimbabwe. From many localities in Turkey. At Saranay and elsewhere in the Ural Mountains, Russia. From the Moa district, northern Cuba, may be crystallized. On Luzon, Philippines. From the Stillwater complex, Montana, USA.

**Name:** For its CHROMium content.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 709–712. (2) Deer, W.A., R.A. Howie, and J. Zussman (1962) Rock-forming minerals, v. 5, non-silicates, 78–81. (3) Clark, G.L. and A. Ally (1932) X-ray examination of chrome ores: (I) lattice dimensions; (II) theoretical densities. Amer. Mineral., 17, 66–74. (4) Cameron, E.N. (1978) The Lower Zone of the Eastern Bushveld Complex in the Olifants River Trough. J. Petrol., 19, 437–462. (5) Wilson, A.H. (1982) The geology of the Great 'Dyke', Zimbabwe: the ultramafic rocks. J. Petrol., 23, 240–292. (6) Chen, Y.L., B.F. Xu, J.G. Chen, and Y.Y. Ge (1992) Fe<sup>2+</sup>–Fe<sup>3+</sup> ordered distribution in chromite spinels. Phys. Chem. Minerals, 19, 255–259.

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