Almandine $Fe_3^{2+}Al_2(SiO_4)_3$

Crystal Data: Cubic. *Point Group:* $4/m\ \overline{3}\ 2/m$. Typically well-formed dodecahedra or trapezohedra, to 1 m; also in rounded grains and massive.

Physical Properties: *Cleavage:* Parting on {110}. *Fracture:* Subconchoidal. *Tenacity:* Brittle. Hardness = 7–7.5 D(meas.) = 4.318 D(calc.) = 4.313

Optical Properties: Transparent to translucent. *Color:* Deep red, brownish red, red-violet, black; may be sectored. *Streak:* White. *Luster:* Vitreous to resinous. *Optical Class:* Isotropic; anomalously biaxial. *Dispersion:* Weak. $n = 1.830$

Cell Data: *Space Group: Ia3d.* a = 11.526 Z = 8

X-ray Powder Pattern: Cavendish Township, Peterborough Co., Ontario, Canada. (ICDD 9-427).
2.569 (100), 1.540 (50), 2.873 (40), 1.599 (40), 4.04 (30), 1.866 (30), 1.660 (30)

Chemistry:

	(1)	(2)
SiO_2	37.39	36.21
TiO_2	0.16	
Al_2O_3	20.72	20.49
Fe_2O_3	0.83	
FeO	36.37	43.30
MnO	0.86	
MgO	3.85	
CaO	0.41	
Total	100.59	100.00

(1) Falun, Sweden; corresponds to $(Fe^{2+}_{2.49}Mn_{0.14}Ca_{0.05})_{\Sigma=2.68}(Al_{1.94}Fe^{3+}_{0.05}Ti_{0.01})_{\Sigma=2.00}(Si_{2.99}Al_{0.01})_{\Sigma=3.00}O_{12}$. (2) $Fe_3Al_2(SiO_4)_3$.

Polymorphism & Series: Forms two series, with pyrope, and with spessartine.

Mineral Group: Garnet group.

Occurrence: The most common garnet, typically in mica schists and gneisses, from regionally metamorphosed argillaceous sediments and pelites; also in contact metamorphic hornfels. In granites and eclogites; in sedimentary rocks; as a detrital mineral.

Association: Biotite, cordierite, chlorite, staurolite, andalusite, kyanite, sillimanite, hematite, plagioclase, amphibole, pyroxene.

Distribution: Widespread. Some localities for fine crystals include: in the Zillertal, Tirol, Austria. At Falun, Sweden. In Norway, from near Bodø. From the Akhmatovsk deposit, near Zlatoust, Ural Mountains, Russia. In the USA, from Roxbury, Litchfield Co., and Southbury, New Haven Co., Connecticut; at Auburn, Androscoggin Co., and Topsham, Sagadahoc Co., Maine; from Westfield and Russell, Hampden Co., Massachusetts; and at Hanover, Grafton Co., New Hampshire. From Avondale, Chester Co., Pennsylvania; a large commercial deposit at the Barton mine, North Creek, Warren Co., New York; at Michigamme, Marquette Co., Michigan; from Salida, Chaffee Co., Colorado; and at Ft. Wrangell, Stikine River, Alaska. In Brazil, at Pernambuco, Bahia. From the Miami district, Zimbabwe. At Broken Hill and Thackaringa, New South Wales, and in the Harts Range, Northern Territory, Australia. From Yamanoo, Ibaragi Prefecture, and the Ishikawa district, Fukushima Prefecture, Japan.

Name: For Alabanda in Turkey, a cutting center in antiquity.

References: (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 437–447. (2) Deer, W.A., R.A. Howie, and J. Zussman (1982) Rock-forming minerals, (2nd edition), v. 1A, orthosilicates, 468–698, esp. 537–589. (3) Novak, G.A. and G.V Gibbs (1971) The crystal chemistry of the silicate garnets. Amer. Mineral., 56, 791–825.