Spessartine $Mn_3^{2+}Al_2(SiO_4)_3$

Crystal Data: Cubic. *Point Group:* $4/m\ \bar{3}\ 2/m$. Commonly as euhedral crystals, dodecahedra or trapezohedra, or in combination with other cubic forms, to 10 cm. Fine or coarse granular, compact, massive.

Physical Properties: *Fracture:* Uneven to conchoidal. *Tenacity:* Brittle. Hardness = 7–7.5 D(meas.) = 4.190 D(calc.) = 4.179

Optical Properties: Transparent to translucent. *Color:* Red, reddish orange, yellow, yellowish brown, reddish brown, brown, black; pale pink to pale brown in thin section, may be sectored. *Streak:* White. *Luster:* Vitreous.
Optical Class: Isotropic; may show weak anisotropism. *Dispersion:* Weak. $n = 1.800$

Cell Data: *Space Group: Ia3d.* a = 11.621 Z = 8

X-ray Powder Pattern: Synthetic.
2.60 (100), 1.557 (40), 1.614 (30), 2.91 (25), 1.886 (20), 1.681 (20), 2.37 (16)

Chemistry:

	(1)	(2)
SiO_2	35.33	36.41
TiO_2	trace	
Al_2O_3	21.50	20.60
FeO	trace	
MnO	41.06	42.99
MgO	trace	
CaO	1.02	
H_2O	0.86	
Total	99.77	100.00

(1) Kinko mine, Yamaguchi Prefecture, Japan; corresponds to $(Mn_{2.82}Ca_{0.09})_{\Sigma=2.91}Al_{1.92}(Si_{2.86}Al_{0.14})_{\Sigma=3.00}O_{12}$. (2) $Mn_3Al_2(SiO_4)_3$.

Polymorphism & Series: Forms a series with almandine.

Mineral Group: Garnet group.

Occurrence: Common in granite pegmatites, granites, and rhyolites. Formed in some skarns and metasomatic manganese-rich rocks adjacent to igneous intrusions or in regionally metasomatized areas.

Association: Quartz, potassic feldspar, tourmaline, rhodonite, pyroxmangite, tephroite, alleghanyite, galaxite, muscovite, topaz, apatite, beryl, albite, bixbyite, pseudobrookite.

Distribution: While a less-common garnet, nevertheless many localities. From Aschaffenburg, Spessart Mountains, Bavaria, Germany. On Seriphos, Cyclades Islands, Greece. In the USA, in Leiper's quarry, Avondale, Delaware Co., Pennsylvania; the Rutherford mine, Amelia, Amelia Co., Virginia; in the Ramona and Pala districts, San Diego Co., California; from the Thomas Range, Juab Co., Utah; at Ely, White Pine Co., Nevada; from near Nathrop, Chaffee Co., Colorado. In Brazil, from Nangue and Urucum, Minas Gerais, and at Carnaúba, near Picui, Rio Grande do Norte. From Marienflüss, Namibia. At Tsilaizina and Anjanabonoina, Madagascar. In the Gilgit district, and at Dusso, Baltistan, Pakistan. From Broken Hill, New South Wales, Australia. At Wada-toge Pass, Nagano Prefecture, Japan.

Name: For the locality near Spessart, Germany.

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. 590–602. (3) Yoder, H.S. and M.L. Keith (1951) Complete substitution of aluminum for silicon: the system $3MnO \cdot Al_2O_3 \cdot 3SiO_2$ – $3Y_2O_3 \cdot 5Al_2O_3$. Amer. Mineral., 36, 519–533. (4) Novak, G.A. and G.V Gibbs (1971) The crystal chemistry of the silicate garnets. Amer. Mineral., 56, 791–825.