

Crystal Data: Hexagonal. *Point Group:* $3m$. In microcrystalline nodules, intimately mixed with rodolicoite, as crystallites to $< 1000 \text{ \AA}$.

Physical Properties: *Tenacity:* Brittle. Hardness = n.d. $D(\text{meas.}) = \text{n.d.}$ $D(\text{calc.}) = 4.08$

Optical Properties: Opaque. *Color:* Reddish brown. *Streak:* Brown. *Luster:* Greasy.
Optical Class: Uniaxial. $\omega = \text{n.d.}$ $\epsilon = \text{n.d.}$

Cell Data: *Space Group:* $[R\bar{3}m]$ (by analogy to synthetic material). $a = 7.994(4)$
 $c = 6.855(4)$ $Z = 3$

X-ray Powder Pattern: Synthetic.

3.09 (100), 1.623 (23), 2.078 (20), 2.446 (16), 1.440 (16), 1.997 (13), 1.545 (12)

Chemistry: (1) Due to the tiny particle sizes (average about 380 \AA) only bulk composition of the mixture could be determined; this is compatible with a composition of $\text{Fe}_{2.99}\text{P}_{1.01}\text{O}_{7.00}$; the identity of the mineral rests also on its X-ray powder pattern.

Occurrence: Very rare, in microcrystalline nodules in lignite beds which appear to have naturally burned.

Association: Rodolicoite, heterosite.

Distribution: From the Castelnuovo mine, Santa Barbara lignite district, 30 km southeast of Florence, Florence, Italy.

Name: Honoring Giuseppe Grattarola (1844–1907), Professor of Mineralogy, Florence University, Florence, Italy.

Type Material: Museum of Natural History, Florence University, Florence, Italy, 2087/RI.

References: (1) Cipriani, C., M. Mellini, G. Pratesi, and C. Viti (1997) Rodolicoite and grattarolaite, two new phosphate minerals from Santa Barbara mine, Italy. *Eur. J. Mineral.*, 9, 1101–1106. (2) (1998) *Amer. Mineral.*, 83, 654 (abs. ref. 1). (3) Modaresi, A., A. Courtois, R. Gerardin, B. Malaman, and C. Gleitzer (1983) Fe_3PO_7 , un cas de coordinence 5 du fer trivalent, étude structurale et magnétique. *J. Solid State Chem.*, 47, 245–255 (in French with English abs.).