

**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:*  $[R3m]$  (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  $380 \text{ \AA}$ ) 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 burned naturally.

**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) Modaressi, A., A. Courtois, R. Gerardin, B. Malaman, and C. Gleitzer (1983)  $\text{Fe}_3\text{PO}_7$ , un cas de coordinence 5 du fer trivalent, étude structurale et magnétique. *J. Solid State Chem.*, 47, 245–255 (in French with English abs.).