## Pyroxferroite $(Fe^{2+}, Mn^{2+}, Ca)SiO_3$



**Crystal Data:** Triclinic. *Point Group:* 1 or $\bar{1}$. As rudimentary crystals and discrete grains.

**Physical Properties:** *Cleavage:* Good on {010}, poor on {001}. Hardness = n.d.
D(meas.) = 3.68–3.76 D(calc.) = 3.82–3.83

**Optical Properties:** Semitransparent. *Color:* Yellow; lighter yellow in thin section.
*Optical Class:* Biaxial (+). *Pleochroism:* Faint; pale yellow to yellow-orange.
*Absorption:* $X' > Z'$. $\alpha$ = 1.748–1.756 $\beta$ = 1.750–1.758 $\gamma$ = 1.767–1.768
2V(meas.) = 34°–40°

**Cell Data:** *Space Group:* $P1$ or $P\bar{1}$. $a = 6.6213$ $b = 7.5506$ $c = 17.3806$ $\alpha = 114.267°$
$\beta = 82.684°$ $\gamma = 94.756°$ Z = 14

**X-ray Powder Pattern:** Sea of Tranquillity, Moon.
2.934 (100), 2.674 (60), 3.09 (45), 4.68 (40), 2.156 (40), 2.579 (35), 1.410 (35)

**Chemistry:**

| | (1) |
|---|---|
| $SiO_2$ | 46.8 |
| $TiO_2$ | 0.5 |
| $Al_2O_3$ | 0.3 |
| FeO | 44.6 |
| MnO | 0.8 |
| MgO | 0.8 |
| CaO | 6.0 |
| $Na_2O$ | trace |
| Total | 99.8 |

(1) Sea of Tranquillity, Moon; by electron microprobe, corresponding to $(Fe^{2+}_{0.81}Ca_{0.14}Mn_{0.03}Mg_{0.03})_{\Sigma=1.01}(Si_{0.98}Ti_{0.01}Al_{0.01})_{\Sigma=1.00}O_3$.

**Polymorphism & Series:** Forms a series with pyroxmangite.

**Occurrence:** As discrete grains in microgabbros or diabase (Sea of Tranquillity, Moon).

**Association:** Clinopyroxene, plagioclase, ilmenite, cristobalite, tridymite, fayalite, fluorapatite, potassic feldspar (Sea of Tranquillity, Moon).

**Distribution:** From the Sea of Tranquillity and Oceanus Procellarum, Moon. From near Iva, Anderson Co., South Carolina, USA. From Väster Silfberg, Värmland, Sweden. At Simsiö, Lapua, Finland. In the Isanago mine, Kyoto Prefecture, Japan.

**Name:** From PYROXene and FERROus iron, and for its relation to *pyroxmangite*.

**Type Material:** Lunar Science Institute, Houston, Texas, USA.

**References:** (1) Chao, E.C.T., J.A. Minkin, C. Frondel, C. Klein, Jr., J.C. Drake, L. Fuchs, B. Tani, J.V. Smith, A.T. Anderson, P.B. Moore, G. R. Zechman, Jr., R.J. Traill, A.G. Plant, J.A.V. Douglas, and M.R. Dence (1970) Pyroxferroite, a new calcium-bearing iron silicate from Tranquillity Base. Geochim. Cosmochim. Acta, Suppl. Proc. Apollo XI Lunar Sci. Conf. 1, 65–79. (2) (1970) Amer. Mineral., 55, 2137 (abs. ref. 1). (3) Burnham, C.W. (1971) The crystal structure of pyroxferroite from Mare Tranquillitatis. Geochim. Cosmochim. Acta, Suppl. Proc. Second Lunar Sci. Conf. 2, 47–57. (4) Deer, W.A., R.A. Howie, and J. Zussman (1978) Rock-forming minerals, (2nd edition), v. 2A, single-chain silicates, 601–613 [pyroxmangite].