Alluaudite $\square NaMnFe^{3+}_2(PO_4)_3$

Crystal Data: Monoclinic. *Point Group*: 2/*m*. *Twinning*: Polysynthetic, with {$\bar{1}$ 01} as composition plane, seen in thin section. Crystals platy to fibrous, to 1 cm; usually radiating fibrous, in nodular aggregates; granular, massive.

Physical Properties: *Cleavage*: {010}, {110}, and {1$\bar{1}$ 0}, good. Hardness = 5-5.5
D(meas.) = 3.45 D(calc.) = 3.62

Optical Properties: Subtranslucent to opaque. *Color*: Dirty yellow to brownish yellow, grayish green; surficially dull greenish black, brownish black, black, when altered; yellow to yellow-green in transmitted light. *Streak*: Dirty yellow.
Optical Class: Biaxial (+). *Pleochroism*: *X* = pale olive-green, straw-yellow to greenish yellow; *Z* = pale olive-greenish to brownish yellow. *Dispersion*: *r* > *v*, moderate, crossed.
Absorption: *Z* >> *X*. α = 1.782(5) β = 1.802(2) γ = 1.835(1) 2V(meas.) = 79.2°

Cell Data: *Space Group*: *C*2/*c*. *a* = 12.004(2) *b* = 12.533(4) *c* = 6.404(1) β = 114°22(5)´ Z = 4

X-ray Powder Pattern: Chanteloube, France.
2.73 (10), 6.36 (8), 3.51 (7), 2.74 (7), 3.08 (5), 5.52 (4), 2.53 (3)

Chemistry:	(1)	(2)		(1)	(2)		(1)	(2)
P_2O_5	44.14	45.15	MnO	16.17	13.42	F		0.72
Al_2O_3	0.01	2.94	MgO	0.27	3.55	$-O = F_2$		0.30
Fe_2O_3	21.16	14.13	CaO	0.05	2.07	Total	99.56	99.65
FeO	12.79	9.40	Na_2O	4.97	8.57			

(1) Mount Wills pegmatite field, Victoria, Australia; corresponds to $\square_{0.95}Na_{0.05}(Na_{0.72}Mn_{0.28})(Mn_{0.83}Fe^{2+}_{0.17})(Fe^{3+}_{0.67}Fe^{2+}_{0.30}Mg_{0.03})Fe^{3+}_{1.00}(PO_4)_3$. (2) Rapid Creek, Canada; by electron microprobe, Fe^{2+}:Fe^{3+} from stoichiometry; corresponds to $(Na_{0.80}Ca_{0.18}Fe^{2+}_{0.02})_{\Sigma=1.00}Na_{0.50}(Mn^{2+}_{0.89}Fe^{2+}_{0.11})_{\Sigma=1.00}(Fe^{3+}_{0.84}Fe^{2+}_{0.48}Mg_{0.42}Al_{0.27})_{\Sigma=2.01}[(PO_4)_{2.96}F_{0.06}]_{\Sigma=3.02}$.

Polymorphism & Series: Forms a series with ferroalluaudite.

Mineral Group: Alluaudite supergroup, alluaudite group (*M2* site = ($Fe^{3+}Fe^{3+}$).

Occurrence: Very common in granite pegmatites, formed by sodium metasomatism of triphylite-lithiophilite, heterosite-purpurite, or ferrisicklerite; in phosphatic nodules in shales.

Association: Triphylite, arrojadite, satterlyite, wicksite, wolfeite, pyrite.

Distribution: Numerous occurrences: in the La Vilate quarry, near Chanteloube, Haute-Vienne, France. At Dolní Bory, near Velkého Meziříčí, Czech Republic. From the Varuträsk pegmatite, Västerbotten, Sweden. In England, at the Tremearne pegmatite, Breage, Cornwall. From the G.E. Smith mine, near Newport, Sullivan Co., New Hampshire; at many localities in the Black Hills, Pennington and Custer Cos., South Dakota, USA. From Rapid Creek, Yukon Territory, Canada. At Sidi-Bou-Othmane, Morocco. From the Buranga pegmatite, near Gatumba, Rwanda. In Zimbabwe, at Mterikati, Miami. In Namibia, at the Tsaobismund pegmatite, 60 km south of Karibib. In the Mount Wills pegmatite field, Victoria, Australia.

Name: Honors François *Alluaud*, mining engineer of Limoges, France, who discovered the species.

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