

**Ferhodsite****(Fe, Rh, Ir, Ni, Cu, Co, Pt)<sub>9-x</sub>S<sub>8</sub>**

**Crystal Data:** Tetragonal. *Point Group:* 4/m or 4/m 2/m 2/m. As isometric or platy, triangular, and corroded grains to 100  $\mu\text{m}$ , adjacent to isoferroplatinum grains.

**Physical Properties:** *Cleavage:* Well-developed on {111}. *Tenacity:* n.d. *Fracture:* n.d. Hardness = n.d. VHN = 516(15) (20 g load). D(meas.) = n.d. D(calc.) = 7.186

**Optical Properties:** Opaque. *Color:* Light brownish gray in reflected light. *Streak:* Black. *Luster:* Metallic.

*Optical Class:* n.d. *Birefractance:* Very weak. *Anisotropism:* Weak to moderate, creamy grays. R<sub>1</sub>-R<sub>2</sub>: (470) 35.6-33.0, (546) 36.0-33.8, (589) 36.2-34.0, (650) 37.1-34.8

**Cell Data:** *Space Group:* P4<sub>2</sub>/n or P4/nmm. *a* = 10.009(5) *c* = 9.840(8) *Z* = 4

**X-ray Powder Pattern:** Russia. (similar to pentlandite)

2.23 (100), 3.01 (70), 1.933 (60), 5.72 (50), 1.772 (40), 1.167 (40), 2.81 (30)

<b>Chemistry:</b>	(1)	(2)		(1)	(2)
Pt	4.23	2.06	Fe	13.77	9.12
Pd	0.16	0.24	Cu	5.68	6.34
Rh	13.26	17.86	Ni	15.01	16.14
Ru	0.15	0.02	<u>S</u>	<u>28.53</u>	<u>28.40</u>
Os	0.23	0.13	Total	100.33	97.63
Ir	19.31	17.31			

(1) and (2) Seyba placer deposit, eastern Sayans, Khabarovskiy kray, Russia; electron microprobe analyses; correspond respectively to (Pt<sub>0.21</sub>Pd<sub>0.01</sub>Rh<sub>1.26</sub>Os<sub>0.01</sub>Ir<sub>0.98</sub>Fe<sub>2.41</sub>Cu<sub>0.87</sub>Ni<sub>2.50</sub>) $\Sigma=8.25$ S<sub>8.71</sub> and (Pt<sub>0.11</sub>Pd<sub>0.02</sub>Rh<sub>1.73</sub>Os<sub>0.01</sub>Ir<sub>0.90</sub>Fe<sub>1.63</sub>Cu<sub>1.00</sub>Ni<sub>2.75</sub>) $\Sigma=8.15$ S<sub>8.85</sub>.

**Occurrence:** In mineral separates from dunite (Nizhniy Tagil ultramafic massif) and Au-PGE-bearing alluvial placer deposits (Konder and along the River Seyba). In grains of Os-Ir-Ru alloy formed from fractionated Fe-Ni-Cu-melt enriched in the PGE. Likely the product of metasomatic replacement of magmatic minerals during serpentinization of ultramafic rocks.

**Association:** Cooperite, cuproiridsite, bowieite, kashinite, laurite, erlichmanite; commonly mantled and corroded by chengdeite.

**Distribution:** From the Nizhniy Tagil, Svetlyi Bor and Veresovyi Bor massifs, Ural Mountains and the Konder placer deposit, Ayano-Mayaskiy region, and along the Seyba River, south-central Siberia, near Krasnoyarsk, Khabarovskiy kray, Russia.

**Name:** From the first letters of three of its main chemical elements, *Fe* (iron), *Rhodium*, and *Sulfur*.

**Type Material:** A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow.

**References:** (1) Begizov, V.D. and E.N. Zavjalov (2016) Ferhodsite (Fe,Rh,Ir,Ni,Cu,Co,Pt)<sub>9-x</sub>S<sub>8</sub> - new mineral from Nizhny Tagil ultramafic complex. *Novye Dannye o Mineralakh* (New Data on Minerals), 51, 8-11 (in Russian with English abstract). (2) (2018) *Amer. Mineral.*, 103, 831-832 (abs. ref. 1 and comment). (3) Barkov, A.Y., G.I. Shvedov, A.A. Nikiforov, and R.F. Martin (2019) Platinum-group minerals from Seyba, Eastern Sayans, Russia, and substitutions in the PGE-rich pentlandite and ferhodsite series. *Mineral. Mag.*, 83, 531-538.