

Table 5. Zoning of directionally crystallized ingots from the primary crystallization region of the monosulfide solid solution of the Cu-Fe-Ni-S system

No.	Initial composition of the melt in at. %				Studied part of the ingot, vol. %	Primary zoning	Phase output, vol. %	Secondary zoning	T °C	Source
	Fe	Ni	Cu	S						
1	30.0	4.0	14.0	51.0	~ 100	Mss/Iss ₁ /Iss ₂	50/25/6	Pyh ^h 1C+Pyh ^h 3C+ Icb + Ccp ^t / Ccp ^t + Iss + Fe-Pn (Sgk) / Ccp ^t + Ni-Pn +NiS+Bn	940	This work
2	32.6	5.4	10.7	51.0	~ 89	Mss/Iss	68/21	Pyh ^m / Pyh ^h +Ccp ^t / Ccp ^t + Ccp ^k + Pn+Bn	1046	Kosyakov et al., 2012
3	33.7	1.5	16.0	48.8	~ 70	Mss/ Iss	40/30	Pyh ^h +Icb/ Pyh ^h + Icb+Fe-Pn/ Pc+Pn/Mh+Pn+Bn	1020	Kosyakov et al., 2012
4	38.5	2.5	10.0	49.0	~ 80	Mss/ Iss	70/10	Pyh+Icb/Pyh+Icb+Fe-Pn/Hc+Fe-Pn+Bn	1097	Sinyakova, Kosyakov, 2014
5	35.5	4.9	10.4	48.3	~ 100	Mss/Mss + Iss ₁ /Iss ₂	50/20/30	Pyh ^h + Ccp ^t /Pyh ^h + Ccp ^t +Fe-Pn/Pyh ^h + Pc+Fe-Pn/Pc+ Fe-Pn+ Bn	1061	Sinyakova, Kosyakov, 2012
6	31.9	1.7	16.0	50.4	~ 100	Mss/Icb/Iss ₁ / Iss ₂	30/2/55/13	Pyh+Icb+Iss (~Cu ₃ Fe ₄ S ₇)/Icb+Iss (~Cu ₂ Fe ₃ S ₅)+Pn/ не опред./Ccp+Put/ Ccp+Tal+Bn	1025	Sinyakova et al., 2019a

Note. T is the liquidus temperature. Phase designations: Pyh^h - hexagonal pyrrhotine, Pyh^m – monoclinic pyrrhotine, Ccp^t - tetragonal chalcopyrite, Ccp^k – cubic chalcopyrite [Vasilyeva et al., 2024], Mh – mooihoekite, Put – putoranite, Icb -izocubanite, Iss – intermediate solid solution, Pc – primitive cubic phase [Cabri, 1973], Pn – pentlandite, Sgk – sugakiite, Bn – bornite.