

CARBONATE-SILICATE-SULPHIDE LIQUID IMMISCIBILITY IS A NEW PHENOMENON IN UPPER MANTLE

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Interrelationship between carbonate, glass and sulphides in metasomatized mantle nodules (Montana Clara (Canary archipelago), Fernando de Noronha and East Antarctic) suggests the equilibrium between carbonate sulphide and silicate melts in upper mantle. We have investigated using the piston-cylinder apparatus the immiscibility in the system Ca-rich carbonate-Fe, Ni sulphide-silicate melt of phonolitic composition containing F. Experiments were conveyed at 1250o C and 4-15 kb. Double Pt capsule method has been employed in order to control oxygen fugacity. The immiscibility has been observed in the investigated system exhibited in the complete separation of carbonate and silicate liquids, where as sulphide melt was present in the form of small globules in both liquids. Sulphur solubility in silicate melt varies from 0.15 to 0.35 %, and in carbonate liquid it ranges from 0.02 to 3,7% depending on alkali content.

T=1230°, P=15 kb

	glass	Carbonate melt	Sulfide melt
F	1.73	5.1	-
NA2O	3.03	7.1	-
AL2O3	13.79	-	-
SiO2	51.51	6.1	-
K2O	1.36	2.72	-
CaO	17.47	42.37	0.31
FeO	6.2	2.97	-
SO3	0.35	4.7	-
S			36.31
Fe	-		62.46
Total	95.44-1.45=93.99	71.06-4.29=66.77	99.08

Therefore, the investigated mineral assemblage including carbonates, glass and sulphides in mantle nodules and obtained experimental data can be considered as a micro model of the carbonatites generation during the partial melting of carbonatized mantle. It is suggested that sulphur was introduced together with carbonate melt in mantle substrate. In the continents there are carbonatite-syenite formation including such complexes as Okorusu (Namibia), Stjernoy (Norway), Phalaborwa (South Africa) which may be considered as an example of this two stage model:

1-stage-metasomatic carbonatization of mantle material, 2-partial melting of metasomatized substrate resulting in carbonate-sulphides –silicate immiscibility and generation calciocarbonatites.

Reference

1. Kogarko L.N., G. Kurat, T.Ntaflos. Carbonate metasomatism of the oceanic mantle beneath Fernando de Noronha Island, Brasil. Contributions to Mineralogy and Petrology. 2001. 140. PP. 577-587.

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