

Experimental study on liquid immiscibility of lamprophyre – Sulfide melt at high temperature and high pressure

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The liquid immiscibility of silicate-sulfide melt is a common geological phenomenon in magmatic processes (Naldrett, 1989; Roedder, 1992). This phenomenon is often used to explain the zonal distribution of ore layers in basic-ultrabasic rocks and the formation of magmatic Cu-Ni sulfide deposits (Naldrett, 1989, 2005). At present, the experimental investigation of liquid immiscibility of the silicate-sulfide melt in synthetic FeO-SiO₂-FeS system has accumulated a lot of data (Fleet and Pan, 1994). But the investigation in the system of natural rocks is hardly conducted.

By taking lamprophyres and pyrites from the Laowangzhai orefield, Yunnan Province, China as starting materials, at 1.5GPa to 3.0GPa and 1160°C to 1560°C, this paper carry out experimental study on liquid immiscibility of lamprophyre-sulfide melt at high temperature and high pressure in the DS-29A cubic 3600t/6 type high pressure apparatus.

The results show that the liquid immiscibility of lamprophyre-sulfide melt in magmatic processes will happen during the early magmatic evolution (high-pressure condition), and this process should also occur in every stage of the magmatic evolution (from high-pressure to low-pressure condition) if sulfur exists. The sulfide melt which separated from the silicate melt will make directional movement in temperature and pressure field and assemble in the low-temperature and low-pressure region. Because the density of sulfide melt is higher than that of silicate melt, the former would gather together in the bottom of magma chamber and there would exist a striking boundary between the two melts.

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References

- Fleet, M. E. and Pan, Y. M. (1994) *Geochim Cosmochim Acta* 58 3369-3377.
 Naldrett, A. J. (1989) *Magmatic sulphide deposit*. London: Oxford University Press.
 Naldrett, A. J. (2005) *Can Mineral.* 43, 2069-2098.
 Roedder, E. (1992) *Geochim Cosmochim Acta* 56, 5-20.

A new genetic model for the Noril'sk-Talnakh Ni-Cu-PGE sulphide deposits

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A popular genetic model for the Ni-Cu-PGE sulphide ores in the Noril'sk-Talnakh intrusions in Siberia which emphasizes a direct link between the sulphide-bearing intrusions and the overlying PGE-depleted basaltic lavas has been criticized because of differences between the intrusions and lavas such as trace element ratios and S-Sr-Nd isotope compositions. In addition, the unusual combination of high PGE concentrations and high $\delta^{34}\text{S}$ values (~11‰) in the sulphide ores has not been explained adequately. Based on our new S isotopic data and mass balance calculations, we suggest that such an unusual combination resulted from anhydrite dissolution in sulphide under-saturated, PGE-enriched magma. We propose that the PGE-enriched magma was generated by complete resorption of early immiscible sulphide liquids in new pulses of mantle-derived, sulphide under-saturated magma in a deep staging chamber. The magma became sulphide saturation again after subsequent assimilation of anhydrite country rocks at shallower levels. Abundant anhydrite xenoliths with $\delta^{34}\text{S}$ values of ~16‰ in the intrusions provide direct evidence for anhydrite-magma interaction during magma ascent and final emplacement. The PGE-depleted lavas which may have contributed chalcophile elements to the early sulphide liquids in the deep staging chamber directly erupted to the surface without interacting with anhydrite-bearing country rocks; thereby they did not acquire anhydrite S isotopic signatures.