Phosphorian rich Fe-sufides-experimental approach

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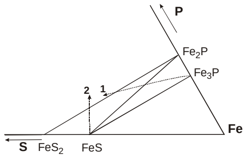
Introduction

Recently, a new group of P-rich Fe-Ni sulfides has been reported from CM2 chondrites (e.g. Devouard and Buseck 1997, Nazarov *et al.* 1999, 2001). Lauretta *et al*. (1998) reported in run products of sulfidation of kamacite also a P-rich phase, in addition to the mixture of barringerite monosulfide solid solution with pentlandite. P-rich sulfides are very fine-grained and their reliable phase description is very difficult. Therefore, we opted for a study of phase relations in the ternary system Fe-P-S using the evacuated silica tube method. Reaction products were examined by X-ray powder diffraction, reflected-light microscopy and by electron microprobe.

Results and discussion

From the phase diagram in Figure 1 it is obvious that in the metal-rich portion of the system at 800ºC, the following univariant assemblages are stable: Fe + FeS + Fe_3P, FeS + Fe_3P +Fe_2P and FeS_2 +FeS + Fe_2P.

Figure 1: Phase relations in the metal-rich part of the Fe-P-S system at 800 ºC.



The results of sulfidation and phosphidation experiments in the Fe-P-S system are displayed in Figure 1. Fe_3P sulfidates through Fe_2P+FeS to FeS +FeS_2 +Fe_2P (1) and FeS phosphidates to FeS_2+Fe_2P (2). The P content in pyrrhotite from the univariant assemblage FeS_2 + FeS + Fe_2P at 800°C is in the range 0.01-0.02 wt.%. On the contrary, P content in natural phosphorian Fe-Ni sulfides is higher and ranges between 1.1 and 7.2 wt %. (Nazarov *et al*, 1998 and 2001). Clearly, additional experiments and crystal-chemical analyses are needed to explain this discrepancy. Barringerite occurring in association with P-rich Fe-Ni sulfides could likewise be a product of phosphidation or sulfidation.

References

Devouard, B., Buseck, P. R., (1997): *Meteoritics and Planetary Sciences*, **32**, Suppl.; 34-35.

Nazarov, M. A., Brandsaetter, F. Kurat, G. (1999). *LPSC* **XXX**, Abstract #1260.

Nazarov M.A. *et al.* (2001) *LPSC* **XXXII**: Abstract #1769.

Lauretta, D.S., Lodders, K., Fegley, B. Jr. (1998). *Meteoritics & Planetary Science*, **33**: 821-833.

Geochemical characterization of obsidian subsources from the Coso Range, California, USA

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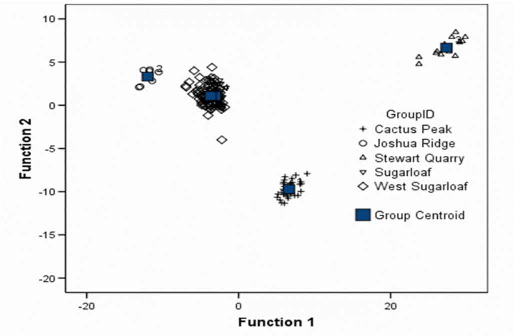
The Coso Volcanic Field contains at least 38 high-silica rhyolite domes, many of which contain workable obsidian (Bacon and Duffield, 1981). The area was quarried by the indigenous population for over 12,000 years (Gilreath and Hildebrandt, 1997) and Coso obsidian artifacts are found throughout the southwestern US. Four separate chemical groups have previously been identified using XRF (Hughes, 1988). Two more were tentatively identified with INAA (Ericson and Glascock, 2004). The four major groups are refered to as West Cactus Peak, West Sugarloaf, Sugarloaf, and Joshua Ridge.

We analysed 250 Coso samples, samples from seven additional eastern California sources, and the new US Geological Survey synthetic basalt-glass standard GSD-1G by ICP-MS with Laser Ablation and after microwave digestion. A total of 25 elements were measured.

Stepwise multi-element discriminant analysis shows that 15 of the measured elements are useful for distinguishing sources and identifies four distinct groups. These are Cactus Peak, Joshua Ridge, Sugarloaf and West Sugarloaf, and Steward Quarry, a newly identified subsource. The fact that ICP/MS analysis could not distinguish Sugarloaf and West Sugarloaf indicates that these sources may be chemically more similar than has been previously suggested. All seven other eastern California sources are easily distinguishable from Coso samples. Our analysis of GSD-1G is similar to published analyses.

Figure 1: Discriminant analysis based on Nb, Ce, Eu, Sr, Mn, Ti, Nd, Gd, Tm, Tb, Zn, Ga, Pr, Y, Rb (in order of significance for separation of groups).



References

Bacon C.,Duffield W. (1981), *J. Geoph. Res* **85** 2381-2404

Ericson J.E., Glascock M.D. (2004), *Geoarch*. **19** 779-805

Gilreath A., Hildebrandt W. (1997), Contributions of the UC Archaeological Research Facility **56** UC Berkeley.

Hughes R.E. (1988), *Geoarch*. **3** 253-265