Source of fluorine and petrogenesis of the Rio Grande Rift type barite-fluorite-galena deposits

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Abundant fluorite mineralization in the Rio Grande Rift (RGR) barite-fluorite-galena deposits is anomalous compared to typical Mississippi valley type deposits. The source of fluorine in these deposits is controversial. We have tested two hypothesized sources for the origin of fluorine in the RGR deposits. These include release of gaseous HF from magmas associated with rifting, and the leaching of fluorine from Proterozoic basement granites that underlie the Pennsylvanian limestones, which host much of the fluorite mineralization in the region.

In this study chlorine isotopes and Br/Cl were measured from fluorite fluid inclusions. Chlorine and fluorine exhibit chemically similar behavior, and therefore are likely to be derived from the same source if chlorine is associated with rift related magmatism. Sr and Nd isotopes were measured from fluorites, granites, carbonates, and asthenospheric basalts to aid in understanding the petrogenesis of RGR deposits.

Sr and Nd isotopic ratios from fluorites are distinctly more radiogenic than local basalts and Pennsylvanian limestones but similar to the Proterozoic granites. The radiogenic character of the fluorites indicates that the Sr and Nd were derived largely from a granitic source with some influence from a carbonate and/or asthenospheric source. $\delta^{37}Cl$ values from fluorite fluid inclusions range from –0.003‰ to +3.069‰ relative to SMOC, and the Br/Cl ratio for all the fluorite samples ranges between 0.00008 and 0.00050, except for San Diego Mountain which has a relatively high Br/Cl ratio of 0.00242. There is a strong positive correlation between $\delta^{37}Cl$ and Br/Cl in the fluorite data that indicates mixing of Cl from asthenospheric magmatic and evaporite sources. The calculated range of Cl derived from an asthenospheric source for the Mex-Tex deposit is 40% to 49%. Similarly, between 35% and 13% of the Cl in the Sunshine deposit is asthenospheric in origin. Since F and Cl likely exhibit similar chemical behavior in this system, the presence of asthenospheric Cl is consistent with an asthenospheric magmatic source of F in the RGR deposits.

Geochemical evidences for origin of metallogenic materials in the Maoping Pb-Zn deposit, Zhaotong, Yunnan, China

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The Maoping deposit is typical of the Carbonate-hosted Zn-Pb deposits in northeastern Yunnan. The spatial distribution of ore bodies are controlled by the NE-extending interstratified fault zones. The deposit includes three ore-bodies that respectively occur in three strata, which are the Zaige Formation (D_3zg), the Baizuo Formation (C_1b), and the Weining Formation (C_2w). The wall rocks are mostly rough crystal dolomite . Based on the geological features of the deposit, 40 tectonite samples from level 910 and 34 samples from level 846 have been collected , with thirty-four elements tested by ICP-MS method. For level 910, five principal factors can be yielded: F_1 (Th, Ta, Ti, Nb, Hf, Zr, ∑REE, Cr, Sc, U), F_2 (-Bi, -Pb, -Tl, -Ag, -Mn), F_3 (Rb, Li, Cs, Ga, Co, V, Sc, Ni), F_4 (-Zn, -Cd, -In), F_5 (As, Ge, Sb, Cu), of which F_2 , F_4 and F_5 represent metallogenic element groups. For level 846 there exist three principle factors: F_1 (Ti, Ga, Th, Ta, Hf, Rb, Zr, Sc, Nb, ∑REE, Cs, Cr, V, Ni, Li, Co), F_2 (-Bi, -Ge, -Pb, -Ag, -Zn, -Cu, -Sb, -Cd), F_3 (In, As, Mo, U), of which F_2 and F_3 may be metallogenic indicators. According to above results, the evidences for origin of ore-forming materials have been found: i) The metallogenic process can mainly be divided into two periods : sedimentary diagenetic period and hydrothermal period. The later can further be divided into the pyrite-sphalerite stage, the sphalerite stage, the galena-sphalerite stage and the carbonate-pyrite stage; ii) Zn derived from strata (C_1b and C_2w) and the external ore-forming fluids. Pb was mostly brought in by the external ore-forming fluids. Therefore, with the study on REE(Hu B. et al, 2003), the information above can indicate that the deposit is a sedimentary-reformed type deposit. Granted jointly by the funds for Fostering Medium-aged and Young Academic and Technical Pioneers (the NSF of Yunnan Province) (99D0003G), Zhaotong Lead-zinc Mine (2001-1) and the Collaboration Program sponsored by the colleges and universities of Yunnan Province (2002UBBEA05B004).