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湖南黄沙坪W-Mo-Bi-Pb-Zn多金属矿床硫铅同位素地球化学研究

作者	单位
祝新友	中色地科矿产勘查有限公司, 北京 100012;北京矿产地质研究院, 北京 100012
王京彬	中色地科矿产勘查有限公司, 北京 100012;北京矿产地质研究院, 北京 100012;有色金属矿产地质调查中心, 北京 100012
王艳丽	有色金属矿产地质调查中心, 北京 100012
程细音	中色地科矿产勘查有限公司, 北京 100012
傅其斌	昆明理工大学, 昆明 650093

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摘要：

湖南黄沙坪W-Mo-Bi-Pb-Zn多金属矿床规模大、矿种多、范围小、分带明显,是南岭有色金属成矿带的代表性矿床之一。成矿地质体
碱长花岗斑岩,与下石炭统灰岩接触带发生大规模矽卡岩化,形成大型钨、钼、铋、萤石以及铁的共生矿床。围绕矽卡岩向外,分布铜锌、铅锌
铅锌银的分带,对应的矿化组合分别为粗粒磁黄铁矿-闪锌矿-黄铜矿、中粗粒磁黄铁矿-闪锌矿-方铅矿、胶状黄铁矿-闪锌矿-方铅矿。围绕花
斑岩,硫化物矿物的$\delta^{34}S$值呈带状分布,其$\delta^{34}S$总体变化为2.3‰~17.5‰,花岗斑岩中浸染状辉钼矿$\delta^{34}S$为17.1‰,矽卡岩中硫化物$\delta^{34}S$
5‰,矽卡岩附近及外侧的铅锌矿体10‰<$\delta^{34}S$<15‰,外围的铅锌银矿体$\delta^{34}S$<10‰。下石炭统中代表沉积特点的细粒浸染状黄铁矿$\delta^{34}S$
为-3.1‰~-22.6‰。铅同位素$^{206}Pb/^{204}Pb$为18.525~18.603,$^{207}Pb/^{204}Pb$为15.706~15.792,$^{208}Pb/^{204}Pb$为38.889~39.1
8。综合研究表明,黄沙坪矿床成矿物质硫和铅主要来自花岗斑岩。经硫同位素热力学平衡计算,引起$\delta^{34}S$值围绕花岗斑岩体分带的主要原因
随温度下降以及物理化学条件变化导致的热力学分馏作用,其次是沉积岩围岩中低$\delta^{34}S$值硫的加入。对南岭地区花岗岩、古生代地层等的δ
S值对比研究发现,引起花岗斑岩岩浆高$\delta^{34}S$值的主要原因是深部富含硫化物($\delta^{34}S$值高)地层对富含挥发份(Li-F)的碱长花岗岩岩浆的混染
用,其次是成矿作用过程中地层与岩浆的相互作用(包括同化混染)。围绕黄沙坪矿床,湘南地区矽卡岩型钨多金属矿存在一个较高的$\delta^{34}S$值
区。宝山矽卡岩型Cu-Mo-Pb-Zn矿床矿石硫化物$\delta^{34}S$为-1‰~3.6‰,$^{206}Pb/^{204}Pb$为18.602~18.672,$^{207}Pb/^{204}Pb$为15.693~15
80,$^{208}Pb/^{204}Pb$为38.901~39.186。因此,宝山矿床与黄沙坪矿床的物质来源和成矿机制不同,宝山矿床硫、铅同位素组成集中,分布范
不同于黄沙坪,成矿物质来自岩浆岩。黄沙坪、宝山矿床代表了南岭地区燕山早期存在两类不同性质的岩浆活动与成矿组合。

英文摘要：

Huangshaping W-Mo-Bi-Pb-Zn polymetallic ore deposit, located at Yizhang County, Hunan Province, South China
s one of the most famous deposits in Nanling tungsten belt. This deposit shows characteristics of multiple elements
ineralization, large ore reserve in a small area < 1 km^2, and typical zonation from skarn-type mineralization to dista
ydrothermal veins. The skarn mineralization of W, Mo, Bi and fluorite occurred at the contact zone between alkali fe
par granite-porphyry and the Lower Carboniferous limestone. The Cu-Zn, Pb-Zn and Pb-Zn-Ag sulfide ore bodies dis
bute from the skarn zone to distal limestone strata, and the mineral assemblage are coarse-grained pyrrhotite (Po)
sphalerite (Sp) -chalcopyrite (Cp), Po-Sp-Galena (Ga), and colloidal pyrite-Sp-Ga, respectively. The $\delta^{34}S$ values of th
sulfide minerals are from 2.3‰ to 17.5‰, and a zonation of the $\delta^{34}S$ value is observed around the granite-porphyry
he $\delta^{34}S$ value of molybdenite disseminated at granite-porphyry is 17.1‰, the sulfide minerals from the skarn zone s
ow $\delta^{34}S$ values >15‰, the lead-zinc orebodies near the skarn show $\delta^{34}S$ values between 10‰ and 15‰, and the d
al Pb-Zn-Ag ore bodies form the limestone strata show $\delta^{34}S$ values <10‰. The disseminated pyrite in the Lower Ca
oniferous sediment rocks shows $\delta^{34}S$ values from -3.1‰ to -22.6‰. The lead isotopic compositions of the sulfide mi
rals are as following: $^{206}Pb/^{204}Pb$ of 18.525~18.603, $^{207}Pb/^{204}Pb$ of 15.706~15.792, and $^{208}Pb/^{204}Pb$ of 38.889~
9.178. According to these results, it is suggested that the sulfur and lead of the Huangshaping deposit may have o
inally came from the granite-porphyry, but also with minor contributions from the limestone strata. The $\delta^{34}S$ zonatio
around the porphyry is probably caused by the thermodynamic isotope fractionation related to the temperature de
asing, varying of the redox conditions and pH values. Alternatively, it is also possible that some amounts of sulfur w
h lower $\delta^{34}S$ value may have also been derived from the Lower Carboniferous sedimentary rocks. The high $\delta^{34}S$ va
es in granite porphyry magma may have been caused by incorporation of the sulfides with high $\delta^{34}S$ values from th
sedimentary rocks at depth (i.e. Devonian carbonate rocks) and by contamination of the carbonate wall rocks durin
ore-forming processes. The Baoshan Cu-Mo-Pb-Zn skarn deposit is located about 9km north of the Huangshaping c

osit, the sulfide minerals from Baoshan show $\delta^{34}S$ values of -1‰ to 3.6‰, and $^{206}Pb/^{204}Pb$ of 18.602~18.672, ^{207}P b/^{204}Pb of 15.693~15.780, and $^{208}Pb/^{204}Pb$ of 38.901~39.186. The Baoshan Cu-Mo-Pb-Zn polymetallic ore deposi how different origin and mineralization mechanism from the Huangshaping deposit. The Bashan deposit has a very rrow range of sulfur and lead isotopic compositions, and the hydrothermal fluid should have derived mainly from the ranodiorite-porphyry magma. Therefore, these two deposits may represent the two types of magmatic activity and neralization at Late Jurassic period in Nanling region, South China.

关键词：硫同位素 铅同位素 矿床成因 成矿机制 钨矿 铅锌矿 湖南省