

付伟,柴明春,杨启军,韦龙明,黄小荣,冯经平. 2013. 广西佛子冲大型铅锌多金属矿床的成因: 流体包裹体和H-O-S-Pb同位素地球化学约束. 岩石学报, 29(12): 4136-4150

广西佛子冲大型铅锌多金属矿床的成因: 流体包裹体和H-O-S-Pb同位素地球化学约束

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基金项目: 本文受到国家基础研究重点规划项目(2012CB416705)、国家自然科学基金青年基金(41102051)、广西自然科学基金(2012GXNSFAA053187)和广西重点实验室建设项目(11-031-20、12-071-20)联合资助

摘要:

佛子冲矿床发育在钦杭成矿带南段广西境内,是近年来在全国危机矿山接替资源勘查项目中取得重要突破的一处大型铅锌多金属矿床。本研究通过流体包裹体和H-O-S-Pb同位素地球化学研究手段,重点提取了佛子冲矿床古益矿区深部矿段的成因信息。流体包裹体分析表明,早期硫化物阶段(阶段I)出现含子矿物型、CO₂-H₂O型和H₂O型包裹体类型组合,而主成矿阶段(阶段II)和晚期硫化物阶段(阶段III)则变化为相对单一的H₂O型包裹体,成矿流体的均一温度和盐度均表现出从成矿作用早期到晚期逐渐降低的趋势。H、O同位素(δD 值介于-5.9‰~-4.1‰, $\delta^{18}O_{H_2O}$ 值介于-5.47‰~4.00‰)和流体包裹体成分指示,初始成矿流体可能来自于岩浆分异热液,但随着成矿作用的进行,天水热液的掺入比例显著增大。矿石硫化物的 $\delta^{34}S$ 值集中于2.3‰~4.3‰,指示矿化剂S主要来自于矿区内的中酸性岩浆岩体系。矿石铅的 $^{206}Pb/^{204}Pb$ 比值为18.592~18.794, $^{207}Pb/^{204}Pb$ 比值为15.648~15.864, $^{208}Pb/^{204}Pb$ 比值为38.909~39.580,数据分布呈线性趋势,且正好落入岩浆铅和地层铅之间,构成一条混合线,它指示了成矿物质可能具有岩浆源和地层源的混合属性。野外地质和矿床地球化学证据都表明,佛子冲矿床的发育与燕山晚期(106Ma)的花岗斑岩侵入事件密切相关,该期岩浆作用在矿区内导致了强烈的热液流体活动并产生了显著的铅锌银多金属成矿效应。河三和古益两个矿区的矿化类型有所不同,前者代表了产在斑岩接触带的矽卡岩型,而后者代表了远离斑岩的中低温热液充填交代型,二者在整体上构成了一个以Pb-Zn为主矿种的岩浆热液流体成矿系统。

英文摘要:

The Fozichong ore district, located in the southern segment of the Qinghang metallogenic belt, is a large-sized Pb-Zn polymetallic deposit in South China. This study presents new data on fluid inclusions and H-O-S-Pb isotopic compositions from the ore bodies in the Guyi deposit of the Fozichong ore district. Analysis of the fluid inclusions reveal that the early sulfide-forming stage (Stage I) is characterized by various types of the fluid inclusions, including the daughter mineral containing type, the CO₂-H₂O type and the H₂O type, but both the main sulfide-forming stage (Stage II) and the late sulfide-forming stage (Stage III) are dominated by the H₂O type. From the early to the late stage, the ore-forming fluids were changed from high-moderate temperature and high salinity to moderate-low temperature and low salinity. Hydrogen isotopic compositions (δD from -5.9‰ to -4.1‰), oxygen isotopic compositions ($\delta^{18}O_{H_2O}$ from -5.47‰ to 4.00‰) and chemical components of the fluid inclusions indicate the initial ore-forming fluids were sourced from the magmatic fluid, and mixed with the meteoric water in later process. Sulfur isotopic compositions ($\delta^{34}S$ from 2.3‰ to 4.3‰) indicate that the sulfur was mainly derived from the felsic magmatic system. The Pb isotopic compositions ($^{206}Pb/^{204}Pb$ of 18.592~18.794, $^{207}Pb/^{204}Pb$ of 15.648~15.864, $^{208}Pb/^{204}Pb$ of 38.909~39.580) reveal that the ore-forming metals were sourced from both the felsic magmatic system and the country rock strata. The formation of the Fozichong Pb-Zn deposit has close association with the granite porphyry intruded in the Late Yanshanian Period (106Ma), and it can be classified as the magmatic-hydrothermal type Pb-Zn deposit. The Hesun and Guyi ore deposits in the Fozichong ore district represent products of the near-source high-moderate temperature magmatic hydrothermal mineralization and the far-source moderate-low temperature hydrothermal mineralization, respectively.

关键词: [成矿流体](#) [同位素地球化学](#) [岩浆热液型铅锌矿床](#) [钦杭成矿带](#) [佛子冲](#)

投稿时间: 2013-08-12 最后修改时间: 2013-11-01

黔ICP备07002071号-2

主办单位：中国矿物岩石地球化学学会

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