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西藏尼雄矿田滚纠铁矿成矿作用机制：来自矿物学和稳定同位素证据

作者	单位
于玉帅	武汉地质矿产研究所, 武汉 430205;中国地质调查局花岗岩成岩成矿地质研究中心, 武汉 430205;东华理工大学核资源与环境教育部重点实验室, 南昌 330013
杨竹森	中国地质科学院矿产资源研究所, 北京 100037
田世洪	中国地质科学院矿产资源研究所, 北京 100037
刘英超	中国地质科学院地质研究所, 北京 100037
纪现华	中国地质大学地球科学与资源学院, 北京 100083
修迪	河北省区域地质矿产调查研究所, 廊坊 065000

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摘要：

本文分析了冈底斯成矿带西段尼雄矿田滚纠铁矿石榴子石、辉石、绿泥石成因矿物学特征,结果显示矿区石榴子石多为钙铁榴石,并存在一定量的钙铝榴石;辉石主要为透辉石、次透辉石和铁次透辉石,表明成矿流体早期为酸性、高温和高氧逸度环境。矿卡岩内接触带富钙铝榴石,外接触带富钙铁榴石,反映成矿流体由矿卡岩内接触带运移至矿卡岩外接触带过程中,温度逐渐降低,而pH和氧逸度逐渐升高。绿泥石主要为富铁贫镁的铁镁绿泥石,其在低温(206~268℃)、低pH值、还原环境下形成。方解石C-O同位素揭示成矿流体$\delta^{13}C_{\sum C}$为-2.6‰~-0.7‰,$\delta^{18}O_{V\text{-}SMOW}$为+9.8‰~+12.0‰。石榴子石、磁铁矿、石英$\delta D_{V\text{-}SMOW}$值为-121‰~-105‰,成矿流体$\delta^{18}O_{H_2O}$为8.7‰~11.3‰,反映成矿流体主要来源于花岗质岩浆。磁铁矿矿石中黄铁矿弱富铁亏硫,S/Fe为1.05~1.07,Co/Ni>1,指示为岩浆热液成因;黄铁矿$\delta^{34}S$为4.2‰~11.1‰,与花岗质岩浆硫相当,综合反映成矿物质也来源于花岗质岩浆。结合前人研究资料,认为高温、高氧逸度使金属元素大量进入岩浆,岩浆上升侵位、分异出富含成矿物质的流体。成矿流体运移过程中遭遇围岩,并与之反应形成矿卡岩和退化蚀变矿物,导致成矿流体物理化学性质改变,在温度(180~400℃)、氧化-弱氧化和弱碱性-碱性条件下,发生磁铁矿沉淀。

英文摘要：

The genetic mineralogy characteristics of garnet, pyroxene, chlorite from Gunjiu iron deposit in Nixiong ore-field, located in the western Gangdise metallogenic belt, are analyzed in this paper, showing that the garnet is mostly andradite, with a certain amount of grossularite existed. The pyroxene belongs to diopside, salite and ferrosalite. The results indicate the ore forming fluid has features of acid, high temperature and high oxygen fugacity. It's concluded that the temperature is decreased and the pH, oxygen fugacity are increased from skarn endocontact to exocontact because of the former is rich in andradite but the latter in grossularite. The chlorites are classified into brunsvigite with enrichment in magnesium and lack of iron, forming at a low temperature of 206~268℃, low pH and reduced environment. $\delta^{13}C_{\sum C}$ values of metallogenic fluids calculated from calcite C-O isotopes are -2.6‰ to -0.7‰, and $\delta^{18}O_{V\text{-}SMOW}$ values are from +9.8‰ to +12.0‰. $\delta D_{V\text{-}SMOW}$ values of garnet, magnetite and quartz range from -121‰ to -105‰, with corresponding $\delta^{18}O_{H_2O}$ values of 8.7‰ and 11.3‰. The isotopic data suggests the source of ore-forming fluids is mainly magmatic water. The pyrite in magnetite shows the same characteristic with magmatic hydrothermal pyrite, with S/Fe values between 1.05 and 1.07, Co/Ni>1. $\delta^{34}S$ values of pyrites range from 4.2‰ to 11.1‰, indicating that sulfur was derived from granite magma. The analysis of pyrite is the favorable evidences that the ore-forming mineral is also derived from granitic magma. Combined with previous research, the high temperature and oxygen fugacity caused the metals poured into magma. The magma intruded above and differentiated a number of ore-forming fluids, which encountered and reacted with country rocks during the migration, causing the formation of skarn and degradation alteration minerals, and finally resulting in changes in physical-chemical properties. Magnetites precipitated under 180℃ to 400℃, weak oxidize to oxidize and kalescent to alkaline conditions.

关键词：矿卡岩矿床 矿物学 稳定同位素 成矿机制 滚纠铁矿 尼雄矿田 西藏

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黔ICP备07002071号-2
主办单位：中国矿物岩石地球化学学会
单位地址：北京9825信箱/北京朝阳区北土城西路19号
本系统由北京勤云科技发展有限公司设计