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冀东司家营BIF铁矿流体包裹体及氧同位素研究

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摘要：

司家营BIF是冀东地区最大的铁矿床，赋存于一套绿帘-角闪岩相变质的新太古代变质岩中，可划分出5个演化期次，分别为沉积期、绿帘-角闪岩相变质期、褶皱变形期、韧性剪切和热液蚀变期以及抬升氧化期。其中绿帘-角闪岩相变质期形成的条纹状阳起磁铁石英岩以及韧性剪切和热液蚀变期形成的条带状磁铁石英岩、块状磁铁石英岩和黄铁矿石英脉的石英中广泛发育流体包裹体，可分为次生包裹体（Ⅰ类）、假次生包裹体（Ⅱ类）、原生包裹体（Ⅲ类）、含子矿物包裹体（Ⅳ类）和含CO_2三相包裹体（Ⅴ类）。分布于条纹状磁铁石英岩石英-1中Ⅱ和Ⅲ类包裹体以及条带状磁铁石英岩石英-1Ⅴ类包裹体的均一温度为352~560℃、流体压力为0.11~0.20GPa、盐度为0.4%~3.3% NaCleqv，流体温压特征可代表绿帘-角闪岩相变质作用的温压条件；分布于条带状磁铁石英岩、块状磁铁石英岩和黄铁矿石英脉石英-2中Ⅱ和Ⅲ类包裹体均一温度集中于153~211.8℃，盐度为0.5%~22.6% NaCleqv，条纹状磁铁石英岩中磁铁矿-1的$\delta^{18}O$值为1.4‰~2.8‰，条带状和块状磁铁石英岩中磁铁矿-2的$\delta^{18}O$值为1.7‰~6.2‰。流体包裹体和氧同位素特征表明低温热液流体是铁矿床发生"去硅富铁"的主要原因；在不同类型矿石的石英中均产出有较多的气液两相和赤铁矿共生的Ⅰ类包裹体，可反映抬升氧化期流体特征，均一温度介于117~223℃，盐度集中分布于0.4%~5.0% NaCleqv，较低的氧化作用是司家营BIF无法形成假象赤铁矿-细板状赤铁矿型富铁矿体的直接原因。

英文摘要：

The Sijiaying BIF, the largest iron deposit in the eastern Hebei Province, located in the center part of Eastern Block, North China Craton, is hosted in epidote-amphibolite facies Neoarchean metamorphic rocks. The evolutionary process can be divided into depositional stage, epidote-amphibolite facies metamorphic stage, folding and deformation stage, shearing and hydrothermal alteration stage, uplifting and oxidizing stage. Both striped actinolite-magnetite-quartzite occured in epidote-amphibolite facies metamorphic stage and banded actinolite-magnetite-quartzite, massive magnetite-quartzite, pyrite-quartz veins formed in shearing and hydrothermal alteration stage contain a variety of fluid inclusions. Five types of inclusions are distinguished including primary (Ⅰ-type) inclusions, pseudosecondary (Ⅱ-type) inclusions, secondary (Ⅲ-type) inclusions, daughter mineral-bearing (Ⅳ-type) inclusions, CO_2-bearing three-phase (Ⅴ-type) inclusions. The homogenization temperatures of the Ⅱ-type and Ⅲ-type fluid inclusions in quartz-1 in striped actinolite-magnetite-quartzite as well as Ⅴ-type inclusions in quartz-1 in banded actinolite-magnetite-quartzite range from 352~560℃, with trapping pressure between 0.11GPa and 0.20GPa and salinities rang from 0.4%~3.3% NaCleqv. They reflect the temperature and pressure of epidote-amphibolite facies metamorphism. The homogenization temperatures of the Ⅱ-type and Ⅲ-type fluid inclusions in quartz-2 in banded actinolite-magnetite-quartzite, massive magnetite-quartzite and pyrite-quartz veins concentrate in 153~212℃, with salinities between 0.5% NaCleqv and 22.6% NaCleqv. The $\delta^{18}O$ values of magnetite-1 from striped actinolite-magnetite-quartzite range from 1.4‰ to 2.8‰; While the $\delta^{18}O$ values of magnetite-2 from banded magnetite-quartzite and massive magnetite-quartzite range from 1.7‰ to 6.2‰, these data indicating fluids of shearing and hydrothermal alteration stage may account for leaching Si and concentrating Fe in Sijiaying BIF, hypogene (hypergene) fluids circulated through shear zones and resulted in forming ban

ded actinolite-magnetite-quartzite, massive magnetite-quartzite and pyrite-quartz veins. Moreover, multi-stage fold and deformation activities may also played an important role in forming banded actinolite-magnetite-quartzite. The homogenization temperatures of Ⅰ-type inclusions in quartzs in all types of ores range from 117~223℃, with salinities mainly between 0.4% NaCleqv and 5.0% NaCleqv, which reflects the characteristics of fluids in the uplifting and oxidizing stage. Relatively low oxidation may be the main reason for which Sijiaying BIF unable formed a large scale of high-grade martite-microplaty ore.

关键词：司家营BIF 流体包裹体 富铁矿 冀东

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