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胶东大尹格庄金矿床铅同位素地球化学

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摘要:

胶东是我国最重要的金矿集区, 破碎带蚀变岩型金矿床是其最重要的金矿床类型, 该类型金矿床已探明金矿资源量占全区的90%以上, 其巨量金的来源是引人瞩目的关键科学问题。招平断裂带是胶东金矿集区内规模最大的断裂-成矿带, 其内已探明金资源量1500余吨, 大尹格庄金矿床位于招平金矿带中段, 是该金矿带最具代表性的破碎带蚀变岩型金矿床之一, 目前勘探深度近-800m, 已探明金金属量约125t。NNE向招平断裂带和NNW向大尹格庄断裂是区内主要控矿构造, 其中招平断裂带沿胶东群与玲珑花岗岩接触带发育, 控制了大尹格庄金矿床的产出。招平断裂带下盘为玲珑黑云母花岗岩, 是金矿床的主要赋矿围岩, 普遍发育黄铁绢英岩化蚀变; 招平断裂带上盘为太古宇胶东群混合岩化黑云斜长变粒岩、碳酸盐片岩和斜长角闪岩及元古代荆山群禄格庄组石榴矽线黑云片岩和黑云片岩, 发育强烈的碳酸盐化。金矿化与绢云母化、黄铁矿化和硅化关系密切, 金矿体赋存在招平断裂带下盘的黄铁绢英岩和黄铁绢英岩化花岗岩碎裂岩中, 主要金属矿物为黄铁矿, 其次为方铅矿、闪锌矿和黄铜矿, 且黄铁矿常与方铅矿和闪锌矿共生。以大尹格庄断裂为界, 其南、北两侧分别为I号和II号矿体, 它们是占大尹格庄金矿床探明储量的85%。相对于II号矿体, I号矿体具有更多的方铅矿和闪锌矿及更高的银含量。I号矿体9件矿石硫化物 $^{206}\text{Pb}/^{204}\text{Pb}$ 、 $^{207}\text{Pb}/^{204}\text{Pb}$ 和 $^{208}\text{Pb}/^{204}\text{Pb}$ 分别为17.2638~17.3585、15.4663~15.6116和37.858~38.3328; II号矿体6件矿石硫化物 $^{206}\text{Pb}/^{204}\text{Pb}$ 、 $^{207}\text{Pb}/^{204}\text{Pb}$ 和 $^{208}\text{Pb}/^{204}\text{Pb}$ 分别为17.2157~17.3286、15.4595~15.5084和37.8900~38.0004, 为放射性成因的异常铅, 经历了三阶段演化史。其中, 3.4Ga左右壳幔分离, 铅在地壳下部和上地幔得到充分混合, 形成均一的正常铅; 0.8Ga左右铅脱离第二阶段储库并与铀钍体系发生分离; 其后, 这种铅与不同数量的放射性成因铅发生混合, 并于约130Ma成矿时被保留在硫化物等含金矿物中。该金矿床成矿物质很可能主要来自于胶东群变质岩的再活化, 成矿过程中, I号矿体中成矿流体与围岩的交换反应作用更强, 有更多的上地壳物质进入成矿流体; 而II号矿体则保留了更多的深部初始成矿物质与成矿流体的信息。

英文摘要:

The gold deposits of the Jiaodong Peninsula define the China's largest gold province. Disseminated-and stockwork-style gold deposit, which accounts for 90% of the proved reserves in Jiaodong Peninsula, is the most important deposit type. Its giant source of gold is a striking and key scientific issue. Zhaoping fault zone, whose proved reserves exceed 1500t Au, is the largest fault-metallogenic belt in Jiaodong Peninsula. Dayingezhuang gold deposit, a typical disseminated-and stockwork-style gold deposit, whose proved reserves are about 125t Au, located in the central part of Zhaoping metallogenic belt. Its exploration depth is nearly -800m. NNE-trending Zhaoping fault and NNW-trending Dayingezhuang fault are the main ore-controlling structures. The Zhaoping fault develops along the contacts between the Jiaodong Group and Linglong granite and controls the occurrence of the gold orebodies in Dayingezhuang gold deposit. Linglong granite locates in the footwall of Zhaoping fault. Generally, it underwent pyrite-sericite-quartz alteration and hosts most part of the gold orebodies. Wall rocks in the hanging wall, which underwent intensive carbonation, comprise migmatization biotite-plagioclase-granulite, carbonate schist and amphibolite of Archaean Jiaodong Group, and garnet-sillimanite-biotite schist and biotite schist in the Lugezhuang Formation of Paleoproterozoic Jingshan Group. The gold mineralization is closely related to sericitization, pyritization and silication. The gold orebodies are located in the pyrite-sericite-quartz altered rock and pyrite-sericite-quartz altered cataclasite in footwall of Zhaoping fault. The main metallic mineral is pyrite, followed by galena, sphalerite and chalcopyrite. Frequently, pyrite is symbiotic with galena and sphalerite. The No. I and II orebodies, located in the south and north of the Dayingezhuang Fault respectively, account for 85% of the proved reserves in Dayingezhuang gold deposit. Comparing with the No. II orebody, the No. I orebody possesses more galena, sphalerite and higher silver grades. Nine sulfide samples selected from ores of No. I orebody

o.I orebody yield $^{206}\text{Pb}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$, $^{208}\text{Pb}/^{204}\text{Pb}$ of 17.2638~17.3585, 15.4663~15.6116 and 37.858~38.3328 respectively. Six sulfide samples selected from ores of No. II orebody yield $^{206}\text{Pb}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$, $^{208}\text{Pb}/^{204}\text{Pb}$ of 17.2157~17.3286, 15.4595~15.5084 and 37.8900~38.0004 respectively. They are radiogenic and anomalous lead, who underwent three stages of evolution. The crust-mantle differentiation occurred at about 3.4Ga when the Pb isotope between the lower crust and upper mantle mixed and formed the normal lead. At about 0.8Ga, the lead escaped from the reservoirs of the second stage. Then it mixed with a certain amount of radiogenic lead. Finally, it was trapped in the gold-bearing sulfide at ca. 130Ma. All these reveal that ore-forming material may mainly be derived from the Mesozoic remobilization of metamorphic rock of the Jiaodong Group. The No.I orebody underwent intensive water-rock reaction accompanied by the mixing of more substance of the upper crust, when the gold deposited from the ore-forming fluids in the brittle faults of upper crust. In contrast, the No. II orebody keeps more information about the initial ore-forming materials and fluids.

关键词: [铅同位素](#) [成矿物质来源](#) [再活化](#) [大尹格庄金矿床](#) [胶东](#)

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