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胶东新城金矿床控矿构造变形环境：显微构造和EBSD组构约束

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摘要：

新城金矿床是典型的“焦家式”破碎带蚀变岩型金矿，矿体形态和规模都严格受到断裂破碎带控制，是探讨复杂构造-流体耦合成矿系统控矿构造变形环境研究的理想选区。断裂破碎带中构造岩既是构造变形行为的载体，也是相应变形环境的受体。论文在新城金矿详细露头构造解析的基础上，系统采集该矿床控矿断裂破碎带定向构造岩样品，进行显微构造和EBSD组构分析。研究区构造岩显微构造特征主要表现为韧性变形和脆性变形。韧性变形有波状消光、带状消光、亚晶粒、动态重结晶、核幔构造、丝带构造、碎（残）斑系、扭折带、变形纹、机械双晶、蠕英结构、云母鱼等；脆性变形有书斜构造和显微裂隙等。长石（残）斑系、扭折带、变形纹、蠕英结构和石英颗粒边界迁移动态重结晶、丝带构造等矿物变形特征表明断裂带成矿前以高温韧性变形为主；石英波状消光、亚晶粒、亚颗粒旋转和膨凸动态重结晶、方解石机械双晶、长石显微裂隙充填物等矿物变形反映成矿期兼有中低温韧性变形和脆性变形；压剪性穿晶裂隙则反映出成矿后主要是低温脆性变形。根据差应力、应变测量和EBSD组构分析，将新城金矿床控矿构造变形环境可以分为3个构造期：成矿前在NW-SE向挤压作用下发生韧-脆性左行剪切变形，600~700℃，差应力61.37~111.09MPa，应变测量轴比a/c为2.295~3.978，动态重结晶石英颗粒边界分维值为1.466~1.599，反映矿区为高温中高压高应变带变形环境，应变速率较大；成矿期为NW-SE向逐渐NEE-SWW向转变的挤压作用，发生压剪性脆性变形，200~500℃，差应力65.91~135.68MPa，应变测量轴比a/c为1.403~2.204，动态重结晶石英颗粒边界分维值为1.321~1.378，反映矿区成矿期为中低温中高压低应变带变形环境，反应速率较小；成矿后在NWW-SEE向挤压作用下发生压剪变形，150~300℃，反映低温低压脆性变形环境。

英文摘要：

Xincheng gold deposit is a typical "Jiaojia" type alteration rock type deposit within cataclastic zone, in that orebodies shape and scale bend to structural control, which is ideal region to do research on ore-controlling deformation environment of the complex structure-fluid coupling metallogenic system. The tectonite in the cataclastic fault zone not only are the hosts of deformation behavior, but also are response for environment of structure deformation. Thus, this paper is based on the detailed structure analysis of the outcrop, collected oriented samples scientifically in the cataclastic zone in Xincheng gold deposit, and conducted microstructure and EBSD fabric analysis. The microstructure features of tectonite in Xincheng gold deposit can be divided into ductile deformation and brittle deformation. Ductile deformations consist of undulatrory extinction, banded extinction, quartz subgrain, quartz subgrain rotation recrystallization, boundary migration recrystallization, ribbon structure, σ type porphyroclast system, δ type porphyroclast system, bink bands, deformation lamella, stress-induced lamellae, myrmekite texture, mica fish and mechanical twin. Brittle deformations include bookshelf structure, pressed shear fracture and tension crack. All of the feldspar porphyroclast system, bink bands, deformation lamella, myrmekite texture, mica fish, quartz boundary migration recrystallization and ribbon structure indicate the high temperature ductile deformations are dominant in the pre-mineralization stage. The quartz undulatrory extinction, subgrain, subgrain rotation, bulging recrystallization, calcite mechanical twin, feldspar tension crack show both ductile deformation and brittle deformation are occurrence in the mineralization stage. The pressed shear fractures without filling represent low temperature brittle deformation in the post-mineralization. In combination with EBSD fabric analysis, ore-controlling structure deformation condition of Xincheng gold deposit can be divided into 3 stages. The ductile-brittle sinistral shear deformation occur in pre-mineralization resulted from NW-SE compression, with temperature 600~700℃, differential stress 61.37~111.09MPa, strain axial ratio measurement a/c 2.295~3.978 and fractal dimension value of the quartz boundary of dynamic recrystallization 1.466~1.599, which indicates the condition with high temperature, high pressure, high strain zone and strain rate in pre-mineralization. The NW-SE compres sion converts into NEE-SWW in mineralization, while brittle pressed-shear deformation arises, with temperature 200~500℃, differential stress 65.91~135.68MPa, strain axial ratio measurement a/c 1.403~2.204 and fractal dimension value of the quartz boundary of dynamic recrystallization 1.321~1.378, which suggests the condition with low temperature, high pressure, low strain zone and low strain rate in mineralization. The NWW-SEE compression results pressed-shear deformation in post-mineralization, with temperature 150~300℃, represents low temperature, low pressure brittle deformation condition.

关键词：显微构造 EBSD组构 变形环境 新城金矿床 胶东

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