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Discussions on the stress-chemical process of gold precipitation in shear zone type gold deposits

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Shear zones are one type of strain localization structures, which are widely developed in various structural environments. There are many gold deposits host in, or spatially associated with first- and second-order shear zones, which we call the shear zone type gold deposits. In geological studies, the genesis of shear zones type gold deposits has long been a major concern, while the precipitation mechanism of gold remains controversial and the cause at the ore-localized portions is seldom considered. To solve these problems, firstly we sort out and analysis the research progress of mineralization in recent years combining with the case study of Jiaodong gold deposits. Using fault-valve model and stress-chemical theory, we find that the ore-localized portions have close links to brittle fractures or joints (especially R, T and R' joints) whether in brittle or ductile shear zones or vein type or altered rock type gold deposits, which are resulted from stress concentration. And during the abrupt rupture, the extreme decrease of fluid pressure and flash vaporization may be the effective mechanism of gold precipitation. Hence, we propose that the stress-chemical process is the key process for gold precipitation in shear zones, which is from stress concentration, brittle fracturing, sudden reduction of fluid pressure, flash vaporization to gold precipitation. Additionally, the structural level of fracturing is not limited to brittle or brittle-ductile shear zones found from many cases, it can also occur in ductile shear zones. The concrete reason is perhaps related to the change of strain rate, which could be the critical metallogenic mechanism to ductile shear zones. Depending on the coupling of magma emplacement, fluid action and shearing action, we suggest that the relatively concentrated portions of stress in shear zones, like the striking-turning positions in strike-slip faults, the dip turn-to-gentle positions in normal faults and turn-to-steep positions in thrust faults, are favourable areas for mineralization.