Paleo-hydrochemical changes of deep groundwater in Mizunami area, Japan

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Introduction

Multilayered fracture-filling calcite mineralization was studied to assess the long-term hydrochemical changes of deep groundwater in the Mizunami area, Japan. Four generations (I to IV) of calcite precipitation can be differentiated on the basis of detailed studies using optical and cathode-luminescence microscopy, SEM, laser ablation microprobe-ICP MS, stable isotope geochemistry, and fluid inclusion analysis.

Results and Discussion

Carbon and oxygen isotopic ratios suggests that the Generation I calcite is of hydrothermal origin. On the other hand, generations II, IV and III calcite were precipitated from freshwater and marine water, respectively. Fluid inclusions could only be observed in calcite generations II and III. These fluid inclusions show no obvious change in fluid salinity between generation II and III calcite mineralization. The generation II and III calcites were possibly precipitated from mixture of freshwater and marine water. The calcite crystal morphology is sensitive to the chemistry and salinity of the groundwater. Morphological change during generations II to IV coincides with the changes of groundwater origin indicated by stable isotope and fluid inclusion composition. On the other hand, REE distribution patterns within the different generations of calcite show that no differential behaviour between REEs and Ce, which is known to be redox sensitive, and the trivalent REEs. This suggests that the redox condition of groundwater have remained relatively reducing during the different generations of calcite precipitation, even though groundwater chemistry had changed.

Conclusion

Detail analysis of multilayered calcite fracture mineralization associated with groundwater flow paths provides a valuable information to evaluate long-term palaeohydrogeological changes of groundwater chemistry.

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Fission-track thermochronology evidence on Wulonggou gold mineralization, eastern Kunlun Mountains, northern Qinghai-Tibet Plateau

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Wulonggou gold ore district is locates at the eastern Kunlun Mountain, northern Qinghai-Tibet Plateau. The mineralization category belong to tectonic altered rock type. The gold mineralization is intensive and distribute mainly along construct-zone. Fission track thermochronology has been used to constrain the mineralization histories of gold ore districts in eastern Kunlun Mountains in this work.

Five zircon fission track ages for the ore and altered rock samples range from 235±9 Ma to 194±10 Ma, concording with various Rb-Sr and K-Ar isotopic ages (207.1-252.9 Ma) for the mineralization (Lu *et al*., 1999; Mock *et al*., 1999; Qian *et al*., 1999). Two apatite fission track ages of the ore samples are 201±7 Ma and 151±6 Ma respectively, which corrected ages are close to the zircon fission track ages and isotopic ages. Therefore, the FT age could presents the time of mineralization thermal events. Another two apatite samples collected both from selvage and faulted lens with 50±3 Ma and 45±4 Ma FT ages recorded late tectonic activities.

Mineralization thermal histories are modeled and the samples produced remarkably similar thermal paths. Polymineralization could be identified. The major mineralization period was around 240~150Ma. It is the polymineralization that not only prolongs the mineralization period, but also enhances mineralization degree. The mineralization temperature didn't exceed about 300°C after about 240 Ma according to the zircon fission track data. The mineralization thermal events were mainly relevant to the subduction along South-Kunlun sutrue and the intrasubduction along Middle-Kunlun zone at that time.

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