

Mineralization timing of the Jiaodong gold province: A summary

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The Jiaodong Au province is located in the eastern margin of the North China Craton. It contains Au resources of >4,000 metric tons, and is the most important gold province in China. Jiaodong is also considered as the only world-class gold accumulation on the planet where relatively young ores were deposited in rocks that are about 2 Ga older.

Historically, the Jiaodong gold province has been subdivided into three belts: the Zhaoyuan-Laizhou, Penglai-Qixia and Muping-Rushan belts, from west to east. Gold mineralization mainly occurs as disseminations and veinlets and/or veins. They are structurally controlled by regional NNE-NE-trending faults and secondary NNE-trending faults, and show similar hydrothermal alteration, mineral associations and isotopic compositions.

Although the nature of the ore-forming fluid and genesis of the gold deposits in the province have been well understood, Au mineralization timing in the province still remains controversial. Most researchers advocate that Au mineralization in the whole Jiaodong province, regardless of mineralization types, was formed at a short time period of 125 to 115 Ma in a single metallogenic event. However, some studies have shown that Au mineralization was as early as ~135 Ma in the Muping-Rushan and Zhaoyuan-Laizhou belts. For example, an $^{40}\text{Ar}/^{39}\text{Ar}$ age of 162Ma of hydrothermal muscovite was obtained from auriferous quartz-sulfide veins at Pinglidian, an anomalous deposit hosted by the Precambrian Jiaodong Group, rather than Mesozoic granites, in the Zhaoyuan-Laizhou gold belt. In addition, younger (~110 Ma) Au mineralization events have also been identified in some deposits (e.g., Rushanm Sanshandao) in the Muping-Rushan and Zhaoyuan-Laizhou belts.

It appears from the above data that three different mineralization events were formed in a very small area in the Muping-Rushan belt. However, this is almost certainly misleading. The older $^{40}\text{Ar}-^{39}\text{Ar}$ sericite age of $156.7\pm 0.6\sim 155.8\pm 0.05$ Ma is probably due to the mixture of magmatic muscovite of the wallrock to hydrothermal sericite. If this is accepted, it is still uncertain whether gold formation was one continuous evolving event or multiple distinct episodes of a gold-forming period considering the variable $^{40}\text{Ar}-^{39}\text{Ar}$ sericite ages of 128.8 ± 0.1 and $107.7\pm 0.5\sim 109.3\pm 0.3$ Ma in Rushan gold deposit. An additional uncertainty is whether the as-yet undated Tangjiagou gold deposit, which is hosted in the Precambrian Jingshan Group basement rocks in Muping-Rushan gold belt, will provide evidence of a >135Ma gold mineralization event as for the Pinglidian gold deposit, which is similarly hosted in metamorphic rocks but in this case of the Precambrian Jiaodong Group. These uncertainties in terms of the timing of Au mineralization make the Muping-Rushan gold belt an ideal area for further geochronology research in the Jiaodong Peninsula.