

Apatite fission track evidences for post-forming change and preservation of the Xiaxitai gold deposits, North-eastern China

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Apatite fission track (AFT) technique is a newly key to understand regional uplift, denudation, ore deposit change and preservation. This work will use apatite fission track method to probe into the change and preservation of the Biaxitai gold deposits, North-eastern China. The Xiaxitai gold deposits is located within the Jiapigou shear zone in the northern margin of the North China Craton. In this belt, auriferous quartz vein types of gold deposits dominantly exist besides a few disseminated types of ore deposits. Post-formation change and preservation of ore deposits are important component parts of both ore deposit geology and mineral exploration.

A total of 8 fission track analysis results have been achieved for the apatite samples from gold ores in different locations. The apatite fission track ages could be divided into three groups, i.e., 128-111 Ma, 86-64 Ma and 48-29 Ma. The first group age recorded that subduction direction of Pacific plate deflected about 80° from SW in 125 Ma to NW in 100 Ma. The third group age coincides with the North China Tectonic Epoch (52-23.3 Ma) when the Pacific plate subduction anticlockwise rotated from NW to NWW.

Based on modeling results using apatite fission track method, there were three stages of geological thermal histories: 160-85 Ma, 85-30 Ma and 30-0 Ma. The three stages have both the cooling rates of 1.30°C/Myr, 0 and 2.50°C/Myr, and the denudation thicknesses of 2.0 km, 0 and 1.6 km respectively.

Thus, the Xiaxitai gold ore district has about 3.6 km denudation thickness. According to the mineralization temperature and pressure, the Xiaxitai gold ore deposits formed in depth of 3-5 km. It is shown that a small part of ore bodies have been eroded, but a majority of ore bodies still keep in the deep, indicating a potential ore prospecting.

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