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论兴蒙造山带叠生成矿作用——以锡林浩特和额尔古纳地块为例

作者	单位
聂凤军	中国地质科学院矿产资源研究所, 国土资源部成矿作用与资源评价重点实验室, 北京 100037
曹毅	中国地质科学院矿产资源研究所, 国土资源部成矿作用与资源评价重点实验室, 北京 100037
丁成武	中国地质科学院矿产资源研究所, 国土资源部成矿作用与资源评价重点实验室, 北京 100037
刘翼飞	中国地质科学院矿产资源研究所, 国土资源部成矿作用与资源评价重点实验室, 北京 100037

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摘要：

兴蒙造山带前寒武纪变质岩中间地块分布广泛，其中锡林浩特和额尔古纳地块以出露范围广泛、岩性组合复杂、后期改造明显和找矿潜力巨大而为人们所关注。找矿勘查结果表明，锡林浩特和额尔古纳地块及邻区铜、铁、铅-锌和银矿床（点）星罗棋布，并且以含有大量锡、钨和钼为特征。这些矿床独特的成矿元素组合（如铜-锡、铁-锡、铜-锡-铅-锌-银、铜-银-锡和铁-钨-钼）及其与前寒武纪变质岩块体和显生宙花岗岩密切时空分布关系均表明，它们很可能是深源岩浆再造和古陆块体活化相互联动（叠生）作用的产物。所谓的叠生作用主要指地壳浅部构造形迹活化和地壳深部物质再造，前者为成岩（矿）物质的就位提供了空间条件，后者为岩（矿）体的形成的奠定了物质基础。钕和铪同位素数据表明，前寒武纪变质岩块体和显生宙含锡、钨和钼花岗岩分别具有完全不同的$\varepsilon_{Nd}(t)$值和$\varepsilon_{Hf}(t)$值，成岩（矿）物质分别属于壳源和幔源，其中后者对前者的叠加改造是导致铜-锡、铁-锡和铜-银-锡等多元素矿床形成的关键因素。叠生成矿作用概念的提出不仅很好地解释了兴蒙造山带含锡、钨和钼多金属矿床的成因，而且为寻找隐伏金属矿床指明了方向。

英文摘要：

Precambrian metamorphic intermediate massifs are widely distributed in the Da Hinggan-Mongolia Paleozoic orogenic belt, among which the Xilinhot and Ergun massifs are the largest ones, and show a complex rejuvenation history. Mineral exploration and regional metallogenic studies show that Sn-, W-and Mo-polymetallic deposits are well developed both in the Xilinhot and Ergun massifs, and can be classified into five types in term of their host rocks and metallogenic features. They are (1) porphyry type Sn, W(Mo) and Cu(Mo) deposits;(2) skarn type Sn-Fe and Sn-Ag-Cu deposits;(3) shallow-emplaced granitoid intrusive dykes (swarms)-related vein type Sn, Wand Mo-W deposits;(4) deep-seated emplaced granitoid intrusive stocks (batholiths)-related vein type Sn, W and Mo deposits;(5) felsic volcanic type Sn deposits. Among all the five type deposits, the first two bear the most important economic significance. It has been noted that Sn-, W-and Mo-polymetallic mineralization occurs within the Precambrian metamorphic massifs, but they have an intimate spatial and temporal relationship with Mesozoic granitoid intrusions. In general, Sn, W and Mo are considered as the continent-affiliation elements, while Cu, Ni, Au and PGE are derived from the mantle-relate magmatic and its related or hydrothermal sources. Preliminary studies show that the rejuvenation of pre-existing crust and lithosphere or/and mantle may be the important factor for the regional metallogenesis of Sn-, W-and Mo-polymetallic deposits occurring within the Xilinhot and Ergun intermediate massifs. The rejuvenation occurs largely via two related processes: reactivation and re-working. The reactivation is normally considered to involve the rejuvenation of discrete structures, whilst reworking involves the repeated focusing of metamorphism, deformation and magmatism into the same crustal-or lithospheric-scale volume. Melting of existing continental lithosphere (mantle) is a dramatic thermal expression of reworking. However, the emplacement of the granitoid magma commonly exploits pre-existing structures and may promote transient fault weakening during emplacement. Thus the vastly different processes of magma generation (reworking) and emplacement (reactivation) are both essentially expressions of the thermal rejuvenation of existing continental lithosphere. Our Nd-Sr-Pb isotopic studies show that the ore-forming materials, dynamic force and fluids may be provided by the Mesozoic granitoid magma. Moreover, the accumulation conditions of the ore-forming materials were given by the reactivation of previous-exist faults and fracture zones. The Mesozoic lithosphere stretching and asthenosphere upwelling may result in the reworking of continental crust (Precambrian metamorphic intermediate massifs) and primitive crust (previously formed mafic igneous rocks with positive $\varepsilon_{Nd}(t)$ and $\varepsilon_{Hf}(t)$ values), and then produced Sn-, W-, and Mo-rich granitoid magma. When the magma moved along reactivated structures developed within the Precambrian metamorphic intermediate massifs, ore-bearing fluids derived from condensation fraction of the granitoid magma filled the structures and replaced country rock, thus forming the Sn-, W-, and Mo-polymetallic deposits. Therefore, it is believed that the all the deposits are the products of the Mesozoic intraplate granitoid magmatic occurring in the Xilinhot and Ergun intermediate massifs. Moreover, the intensive superimposition of the Mesozoic tectono-magmatic events and the Precambrian metamorphic massifs may greatly upgrade the enrichment of the Sn-, W-and Mo-polymetallic elements. The rejuvenated metallogenic model and mineral exploration criteria of the Sn, W and Mo-polymetal

lic deposits can also be used as useful tool during the comprehensive evaluation of concealed deposits in the Da Hinggan-Mongolia Paleozoic orogenic belt.

关键词：锡,钨和钼多金属矿床 再造 活化 叠生成矿作用 中生代花岗岩 锡林浩特地块 额尔古纳地块 兴蒙造山带

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