

Nonferrous, Precious and Rare Metals Metallogeny of the Caucasus and Pontides

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ABSTRACT

Nonferrous, rare and precious metals deposits are widespread in the Caucasus and Pontides regions. Here due to Phanerozoic evolution of Tethys Ocean arose various geodynamic settings – oceanic, intra-arc, back-arc and island arc in precollision stage and evolution terminated by postcollisional settings. The various types of mineralization were controlled by geodynamic evolution and depended on the participation scale of sialic, basaltic crusts and mantle sources. In oceanic setting cupriferous Cyprus type deposits occur, where source of Cu is the mantle. In intra-arc setting Besshi type Cu-Zn deposits were developed; source of Zn must be basaltic crust. As for the island arc and back-arc settings, Cu-Pb-Zn porphyry, stockwork, VMS and vein deposits are common. The source of Pb here is sialic crust, which is absolutely absent in oceanic and intra-arc settings. So mineralization of the oceanic and intra-arc settings is determined by mantle and basaltic crust influence, whereas sources of island arc and back-arc mineralizations sialic, basaltic crust and mantle. The rare metals (Hg, W, Sb) related to postcollisional setting are generated mainly in host rocks of sialic crust and they are absolutely absent in the oceanic, intra-arc, back-arc and island-arc settings of the Caucasus and Pontides. Mo is also related mainly to postcollisional settings, it subordinately participates in the island arcs, however it is unknown in oceanic, intra-arc and back-arc settings, so it is mainly extracted from sialic crust. As for precious metals (Au and Ag) their significant mineralization predominantly developed in island arc and postcollisional settings, whereas only subordinate gold and silver exists in oceanic, intra-arc and back-arc settings. Therefore in the process of mantle depletion and crust formation precious metals (Au and Ag) are mainly accumulated in sialic crust.

Hence source of Cu must be mantle, source of Zn – basaltic crust, whereas sources of Pb and rare metals (Hg, W, Sb, and Mo) is sialic crust, as well as predominantly for Au and Ag.

As mantle and basaltic crust sources participate in all settings, from oceanic up to postcollisional, so Cu and Zn mineralization occur everywhere. At the same time Pb and rare metals (Hg, W, Sb and Mo) appear only in island arc and postcollisional settings, where participation of sialic crust is the most significant.

Keywords: mantle, crust, island arc, intra-arc, back-arc, rare metals.

INTRODUCTION

The Caucasus and Pontides were developing during the Phanerozoic evolution of Tethys ocean and along its active and passive margins. As a result oceanic, intra- arc, back-arc

and island arc terrains occurred. The process was terminated by postcollisional activity. Geodynamic development is clearly reflected in volcanic activity and nonferrous, precious and rare metals metallogeny.