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Porphyry deposits of the Urals: geological framework and metallogeny

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Abstract

Most of the Cu (±Mo,Au) porphyry and porphyry-related deposits of the Urals are located in the Tagil-Magnitogorsk, East-Uralian Volcanic and Trans-Uralian volcanic arc megaterranes. They are related to subduction zones of different ages:

(1) Silurian westward subduction: Cu-porphyry deposits of the Birgilda-Tomino ore cluster (Birgilda, Tomino, and Kalinovskoe) and the Zeleny Dol Cu-porphyry deposit;

(2) Devonian Magnitogorsk eastward subduction and the subsequent collision with the East European plate: deposits and occurrences are located in the Tagil (skarn-porphyry Gumeshevskoe etc.) and Magnitogorsk terranes (Cu-porphyry Salavat and Voznesenskoe, Mo-porphyry Verkhne-Uralskoe, Au-porphyry Yubileinoe etc.), and probably in the Alapaevsk-Techa terrane (occurrences of the Alapayevsk-Sukhoy Log cluster);

(3) Late-Devonian to Carboniferous subduction: deposits located in the Trans-Uralian megaterrane. This includes Late-Devonian to Early Carboniferous Mikheevskoe Cu-porphyry and Tarutino Cu skarn-porphyry, Carboniferous deposits of the Alexandrov volcanic arc terrane (Bataly, Varvarinskoe) and Early Carboniferous deposits formed dew to eastward subduction under the Kazakh continent (Benkala, etc.).

(4) Continent-continent collision in Late Carboniferous produced the Talitsa Mo-porphyry deposit located in the East Uralian megaterrane.

Porphyry mineralization of the Magnitogorsk megaterrane shows an evolving relationship from gabbro-diorite and quartz diorite in the Middle Devonian (Gumeshevskoe, Salavat, Voznesenskoe) to granodiorite-plagiogranodiorite in the Late Devonian (Yubileinoe Au-porphyry) and finally to granodiorite in the Carboniferous (Talitsa Mo-porphyry) with a