Abstract

The Elatsite porphyry copper deposit is located in the Panagyurishte district where progressive north-south migration of the magmatism and the associated hydrothermal deposits (porphyry Cu-Au and high-sulfidation epithermal) has been registered from 92 Ma in the north to 86 Ma in the south. Several authors describe the magmatic-hydrothermal systems at Elatsite deposit, but alteration, zonation, and geochemistry of the alteration products were not extensively studied. This study aims to characterize the alteration styles occurring at Elatsite and their spatial and genetic relationship with the mineralization by combining quantitative mineralogical approach and major and trace element geochemistry.

Two alteration events have been recognized for the first time in the Elatsite deposit. The first one corresponds to a Na-Ca alteration in the Vejen pluton, probably with Carboniferous age. A potential genetic connection between this alteration and the mesothermal gold mineralization at the nearby Svishti Plaz deposit is suggested in this work. The second alteration event corresponds to an early albite-rich alteration affecting both the Vejen pluton and the Late Cretaceous porphyries. This albite-rich alteration is followed by the widely distributed K-alteration and sericite-rich alteration. Late adularia-bearing veins overprint the previous alteration styles and the economic mineralization.

Mass balance calculations on selected samples from the different alteration zones demonstrate important variations in the major element distribution.

Trace element analysis shows the maximum Cu enrichment for the samples from the Big dike. Furthermore, we have observed mobility in REE and Zr. Fluorine-rich later fluids may be related with the mobility of these elements.

Electron microprobe analyses of magmatic and hydrothermal biotite from different magmatic host rocks in different alteration zones are indicative of a general decrease in HCl activity during alteration, that could be related to a late meteoric water overprint of the system. The activity of HF is increasing in the hydrothermal biotites (especially for the shreddy biotites from the sericite-rich alteration zone), resulting in partial quartz dissolution observed in some samples and the presence of late fluorite-bearing veins.