Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07094, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07094
EGU General Assembly 2008

Cathodoluminiscence petrography and fluid inclusions study of some quartz samples from Rosia Montana epithermal Au-Ag deposit, Metaliferi Mountains, Romania

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The epithermal Au-Ag deposit of Rosia Montana is located in the historical mining district known as "Golden Quadrilateral", within the Metaliferi Mountains, in western Romania. Rosia Montana is a breccia-hosted epithermal system, associated with strong phreatomagmatic activity related to the shallow emplacement of the Rosia Montana dacite (13.61-13.15 Ma). The dacite intruded into Miocene volcanoclastic sediments and mainly crops out at Cetate and Carnic Hills. The hydrothermal alterations (adularia-sericite, silicification and argillic) are extremely well developed. The mineralization (12.85-12.71 Ma) consists of an epithermal intermediate-sulfidation assemblage (quartz, adularia, carbonates, pyrite, sphalerite, galena, chalcopyrite, tennantite-tetrahedrite, tellurides and native gold) and occurs in stockworks, veins and disseminations within the dacite, different type of breccias and epiclastic and sedimentary rocks.

A reconnaissance study of primary fluid inclusions from the hydrothermal prismatic quartz and magmatic quartz phenocrysts was carried out to asses the spatial and temporal evolution of the ore forming fluids.

Based on phase proportions at room temperature and the homogenization behavior, three major types of two-phase (liquid and vapor) fluid inclusions have been identified in the hydrothermal quartz in breccias from Carnic and Cetate Hills, as follows: Type

I fluid inclusions is liquid rich and homogenize by disappearance of the vapor phase. The measured homogenization temperature (Th), range widely between 234˚C-379˚C; Type II fluid inclusions is vapor rich wich homogenize also by vapor disappearance showing two distinct populations, first between 259˚C-277˚C and the second between 401˚C-443˚C; Type III fluid inclusions wich is vapor rich and homogenize by expansion of the vapor faze at temperatures between 523˚C-535˚C.

The magmatic quartz phenocrysts from the Rosia Montana dacite contain inclusions of minerals, melt and fluids. Microthermometric measurements of fluid inclusions, revealed two phase fluid inclusions wich are vapor rich and show a well-defined bimodal distribution of Th with values between 458˚C-493˚C and 542˚C-549˚C. Some of the magmatic quartz crystals preserve fluid inclusions found in the hydrothermal quartz, described as type I and type II fluid inclusions. All the melt inclusions are arranged along growth surfaces of the quartz crystal andthey have Th $>600^0$C.

The cathodoluminiscence (CL) petrography revealed two different types of hydrothermal prismatic quartz. The first generation of quartz shows dark and light luminescent internal zonation. The second generation is dark luminescent with no internal zonation. The CL response might be related with composition changes of the quartz-forming fluids (temperature or pH changes and variability in the trace elements content) during mineral formation. The magmatic quartz crystals are dark luminescent and the late formed cracks appears to be partially re-filed with carbonate. The melt inclusions trapped in the quartz phenocryts are light luminescent and shows a concentric pattern.