Geophysical Research Abstracts,
Vol. 11, EGU2009-1330, 2009
EGU General Assembly 2009

The Case of Carpathian (Transylvanian) Gold and its Use for Archaeological Items

D. Stan (1), B. Constantinescu (1), A. Vasilescu (1), M. Radtke (2), U. Reinholz (2), D. Pop (3), and C. Ionescu (3)

(1) National Institute of Nuclear Physics and Engineering, Bucharest, Romania (daniela@nipne.ro / 4021.457.44.40), (2) Federal Institute for Materials Research and Testing (BAM), Berlin, Germany, (3) Faculty of Geology, Babes-Bolyai University, Cluj-Napoca, Romania

Romania was one of Europe's main gold-producing areas since the antiquity, especially through the ore deposits in the "Golden Quadrilateral" of the Western Carpathians. The Babeş-Bolyai University in Cluj-Napoca hosts a gold collection consisting of about 500 samples, most of them from Roşia Montană. The geochemical investigation of Romanian gold by using SR-XRF and micro-PIXE is currently in progress; some preliminary results point to interesting features. The goal of the study is to verify if Transylvanian gold was used to manufacture Romanian archaeological objects. This is realized by using information related to trace elements: Sb, Te, Pb – recognized fingerprints for Carpathian Mountains mines and Sn characteristic for the panned river-bed (alluvional) gold. To solve these issues, samples (grains, nuggets, fine gold "sand") from various Transylvanian mines and rivers and some very small (few milligrams) fragments of archaeological objects are measured. Another outcome of this SR-XRF experiment is to obtain the elemental characterization (Au, Ag and Cu) of representative gold mines, subject of interest for the assignement of any other archaeological artifacts to one of the Central European gold sources. During the experiment, point spectra for 22 natural gold samples and 18 "micronic" samples from archaeological objects were acquired at 34 keV excitation SR energy, using a spatially resolved SR-XRF set-up mounted for analyses at the hard X-ray beam line – BAMline at BESSY, Berlin. A summary for the characterization of Transylvanian native gold is the following: high (8 - 30%) Ag amounts and low (0.2 - 1%) Cu amounts; placer deposits contain as fingerprint Sn (150-300 ppm) – most probably from river bed cassiterite; primary deposits present as fingerprints Te (200-2000 ppm), Sb (150-300 ppm) - however, the samples are very inhomogeneous. The micro-PIXE experiment was performed at the AN 2000 Van de Graaff accelerator of Laboratori Nazionali di Legnaro. Elemental maps of gold samples were obtained, complemented by nuclear microprobe point analyses in selected areas of the mapped gold crystals. At Roşia Montană, the mapping evidenced a peculiar microfabric consisting of mm-sized laths of a Zn-S rich phase (with minor Cu and Fe). Au content shows a wide compositional range: 36–57%. A clear chemical inhomogeneity of the Au/Ag ratio, as well as of the local concentration of other elements (Cu, As, Sb, Te, Pb, Fe) was noticed at submilimeter scale. The presence of associated mineral phases (such as Cu, Ag, chalcopyrite, galena, sphalerite, arsenopyrite, pyrite/marcasite and non-metallic minerals) at microscopic scale could be thus illustrated. As concerning the archaeological samples, for "koson" dacian coins, the type "with monogram" is made from refined (more than 97%) gold with no Sb, Te or Sn traces (remelted gold) and the type "without monogram" is clearly made from alluvial gold, partially combined with primary Transylvanian gold (Sn and Sb traces detected). The greek "pseudolysimachus" type staters (contemporary with "kosons") are made from refined remelted gold (no Sn, Sb, Te presence).