remarkable lustre. Also in the present obsidian lumps of different size can be found on clayey sediments in vineyards at the position of Viničky. Interesting remains of trunks of Tertiary trees, which were devastated by volcanic activities, are known as *wood opals*. One part of their wooden mass burned; the other was buried in volcanic ash and gradually impregnated with opal mass to give rise to attractive colourful remains with characteristic structure of original woods - chestnut trees, laurel trees and other thermophilous plants as well. Polished opals have impressive appearance and like obsidians, they can be used for jewellery. When set in jewels, their banded structure becomes apparent in play of colours. This quality is specific with embossed cuts. The site of Veľký Ďur-Rohožnica is a typical deposit. Wood opals from Povrazník are those with nice colours. They are of brown, orange, orange-red colours and have bright glassy lustre. Wood opals occur in positions of pyroclastic rocks of stratovolcanos. *Common opals* occur at several places in Slovakia as well, often accompanying wood opals and chloropals. They have glassy to dull lustre and different colour variations. Rather big accumulations were unearthed e.g. near Mochovce (Dobrica) in vein fillings of andesite rocks. Another type of opal is the one from the crust of a weathering ultrabasic body near Hodkovce, eastern Slovakia. It also occurs in a variety of colour variations, from light yellow to green (colouring due to Ni mixtures.

Attractive stuff for cabochon cuts and minute embossed cuts are *fuchsites* or fuchsitic quartzes (occurring at Rudňany). They make altered rims of ultrabasic bodies and at some placed they are rather thick. Their negative feature is that they have been secondarily fractured to a high degree.

Fractions of exclusive high-quality *epidotites* are suitable for decorative purposes as well. They are vein fillings in granitoid rocks of the Tríbeč hills. Epidote veinlets are solid and massive and they can be as thick as several centimetres. Interesting pebbles can be found in alluvia of brooks crossing the mountain range. Being cut and polished, initially modest boulders obtain attractive structure and lustre. The *Levice travertine*, known as "golden onyx" for its remarkable colouring and banded structure, has been used for decades traditionally. First it was used for interior facing of noble mansions and burial vaults. Later utility artefacts, such as bowls and writing sets were made of it. In present tiny gemstones and accessories are made of its waste.

The Vth century AD jewellery from Cluj-Napoca (Romania): a non-destructive investigation

Ionescu C.[1], Simon V.[1], Nagy S.[2], Hoeck V.[3,1], Nagy-Póra K. [1], Rotea M.[2] and Filipescu S.[1]

[1]*Babes-Bolyai University Cluj-Napoca, Romania, corina.ionescu@ubbcluj.ro*
[2]*National History Museum of Transylvania, Cluj-Napoca, Romania*
[3]*Paris Lodron University, Salzburg, Austria*

The 2007 archaeological excavations carried out at the Polus Centre 5 km west of Cluj-Napoca (Romania), exhumed among others a princely tomb containing gold jewellery. It belongs to the Gepids, an East Germanic tribe which settled down in the nowadays Transylvania, in the second half of the Vth century AD. Nine gold pendants inlaid with a total of 45 slices of red gemstone were subject of a non-invasive (nor sampling neither dismounting of the gems from the jewels) and non-destructive (no damage to the gem) study. Previously, the gemstones were macroscopically assigned to the ruby variety of corundum.

Each pendant has a total length around 3.85 cm and consists of two parts: a leaf-shaped lower one, with four tablet-cut gemstones and an upper part, half moon shaped, with one gemstone. The stones are mounted in the cabochon technique and backed by a *paillon* – a reflecting layer of thin golden foil, stamped with a very regular and small cross-hatched pattern. Tiny gold balls decorate the pendants.

The observation with a stereomicroscope under normal light shows that gemstones consist of a highly transparent, dark red material. Almost each piece has a number of tiny inclusions, such as crystallographically oriented rutile needles intersecting at 70^{o}, rutile „dust", negative crystals, and probably apatite. Black, sometimes hexagonal-shaped, platy crystals are most likely ilmenite and occur frequently. The VIS spectra revealed absorption

bands in the violet and the blue/green transition zone, which can be assigned to Fe. The refraction index of some gemstones, measured with a Standard refractometer, is 1.78. The gemstones are isotropic.

The X-Ray diffraction and X-Ray fluorescence analyses on the pendant inner side showed only Au lines. No traces of other elements such as Ag, Te, Cu, Hg, Sb, Pt, Sn, which might allow tracing the origin of the gold, were seen. The pendant face containing gemstones additionally produced Fe lines. The Raman spectroscopy analysis in respect to the gemstones shows the typical spectrum of almandine, with the 350, 500, 550 and 915 cm^{-1} bands.

Based on optical characteristics, inclusion types, as well as the XRD, XRF and Raman spectroscopy data, the gemstones from the V^{th} century AD Gepidic pendant are most likely garnet group minerals, *i.e*. almandine.

Acknowledgements: The study was financially supported by ID-2241 project funds (Romanian Ministry of Education).

Microchemical and microstructural characteristics of cystine (a renal stone)

Iordanidis A.[1], Garcia-Guinea J.[2] and Goundas I.[1]

[1]*Department of Geotechnology and Environmental Engineering, Technological Educational Institute of Western Macedonia, Kila, 50100 Kozani, Greece, aiordanidis@yahoo.co.uk*
[2]*Museo Nacional Ciencias Naturales, CSIC, C/ José Gutierrez Abascal 2, Madrid 28006, Spain*

Cystine is a rare renal stone (less than 2% of the patients forming urinary stones), an organosulphur amino-acid compound with a chemical formula $(SCH_2CH(NH_2)CO_2H)_2$. Cystine stones are produced by an inherited disorder of the transport of amino acid cystine that results in excess of cystine in the urine. And thus may present a significant problem in urinary tract. Characteristic white culculi was provided by a male patient living in Kozani's area. These calculi were not previously identified, and thus was not determined as cystine stones. A comprehensive analytical study took place, employing the following analytical techniques: Electron Probe Micro-Analysis (EPMA), X-Ray Diffraction (XRD), thermal analysis (thermogravimetry TG/ Differential Thermal analysis DTA) Environmental Scanning Electron Microscopy (ESEM) coupled to a Cathodoluminescence (CL) tube. A characteristic concentric texture is clearly shown under the Electron Microprobe and the ESEM, with thick cystine layers inter-bedded with thin calcium hydroxyl-apatite layers. The elevated concentrations of sulphur are clearly shown under electron microprobe, while calcium and phosphorous prevail within the apatite regions. Characteristic hexagonal cystine crystals are observed under higher magnification. The mineralogical (XRD) analysis revealed a clear L-cystine structure (the less soluble amino-acid found in the urine). The thermal analysis revealed the characteristic endothermic peak at 248 ^oC found in L-cystine and a high amount of mass loss (90%), as expected for such an organic compound. Cathodoluminescence spectra were obtained from several areas of the stone. Some peculiar luminescence was observed on specific spots and is probably related to the cystine. Unfortunately, there are no relevant CL spectra of cystine samples found in the literature, thus preventing a comparative study. Nevertheless, our CL experiments are launching cathodoluminescence technique as a significant analytical technique for biomaterials characterization. In conclusion, our study proves that bio-geochemistry and the application of powerful analytical techniques could substantially help the medical advisors. In particular, having a thorough micro-chemical and structural analysis of an urinary stone, the medical treatment of diseases related to stone formation could be better scheduled. Knowledge of the precise stone composition may allow physicians to recommend an appropriate prophylactic therapy for the patient and thus prevent or delay the cystine stone recurrence.