Development of a transmitted-light dual-window UHV laser cell for *in situ* ^{40}Ar-^{39}Ar geochronology

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In situ high spatial resolution ultraviolet (UV) laserprobe ablation permits Ar extraction from specific target areas identified within discrete mineral phases and ^{40}Ar-^{39}Ar dating of intracrystal zonation and phase trnasitions (e.g. Mark *et al*., 2005). A laser spot resolution of 8 µm can now be achieved by the latests UV laserprobes but the optic systems for normal UHV laser cells rely on reflected light technology. Reflected light produces low-resoltuion images with respect to discrimination of mineral phases, grain boundaries and zonation etc. Because of the poor optics, poorly-polished thick slices of rocks and minerals are the normal samples used for *in situ* ^{40}Ar-^{39}Ar geochronology.

This contribution describes the development and application of a transmitted-light dual-window UHV laser cell for *in situ* ^{40}Ar-^{39}Ar geochronology. The cell has been designed and constructed *in house* at the NERC Argon Isotope Facility, SUERC and offers the users the ability to view samples in transmitted plane-polarised light (Fig. 1), transmitted cross-polarised light and reflected light (ring and coaxial sources). Doubly-polished thin wafers (~80 µm) of rock and minerals are utilised as are individual crystals and grains (e.g. K-feldspar and muscovite).

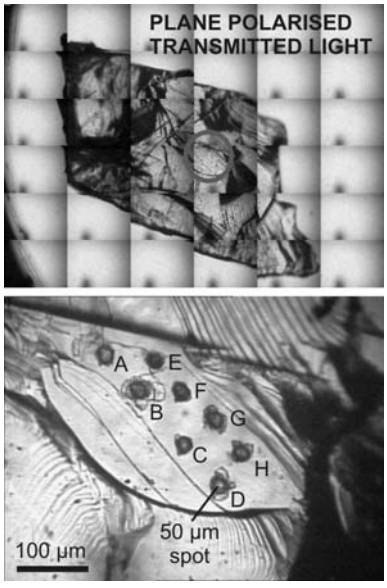

Figure. 1: Images taken in laser cell. (top) Map Cleavage fragment of Benson Mines Orthoclase in plane polarised transmitted light. The circle shows actual study area (bottom) and the locations of eight 50 µm diameter UV laser spots (A-H)

Usage of tritium, δD, δ^{18}O and chemical data in the hydrogeological investigations of the karstic area – Lička Jasenica

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Traditional investigations of groundwater resources in karstic areas usually utilize geological, hydrogeological and water quality data in order to establish a conceptual model for the investigated aquifer. Sometimes, such data are not always fully available. In order to overcome these obstacles the combined hydrogeological and geochemical approach was used for a conceptual model of the investigated karstic aquifer.

In August and November 2007 and April 2008, water samples were collected from two springs: Veliko vrelo and Malo vrelo. Prior to taking groundwater samples, EC, TDS, T and pH were measured. Water samples were analyzed by LabAlliance ion chromatographer (concentrations of major anions) and Perkin Elmer AAS (concentrations of major cations) at the Croatian Geological Survey. The δ^{18}O and δD were analyzed by using the CO_2 equilibration [1] and the zinc reduction method [2] at the Joanneum Institute, Graz. Tritium activity in water samples was measured at the Ruđer Bošković Institute by a gas proportional counting (GPC) technique. From water sample (50 ml), CH_4 is obtained by reaction of water with aluminium carbide at 150°C [3]. Purified CH_4 is then used as a counting gas in a multi-wire GPC [4]. The lowest tritium activity that can be distinguished from the background, i.e., the limit of detection is 1.9 TU.

According to the chemical composition the spring waters belong to the Ca-HCO_3 hydrochemical type. Total dissolved solids, EC, T and δ^{18}O and δD show that on both springs have the same catchments area. The lowest value of ^{3}H was measured on Veliko vrelo in 08-2007 (<2.4 T.U.) during hydrological minimum and on Malo vrelo in 11-2007 (<2.4 T.U.) during hydrological medium. The highest values of ^{3}H were measured on both springs during hydrological maximum. The tritium indicated that the delay response of the Malo vrelo comparing to the Veliko vrelo.

[1] Epstein *et.al.* (1953) GCA **4**, 213-224. [2] Coleman *et.al.* (1982) *Anal. Chem*. **54**, 993-995. [3] Horvatinčić (1980) Fizika **12**, 201-218. [4] Krajcar Bronić *et.al*. (1986) *Meth. Physics Research* **B17,** 498-500