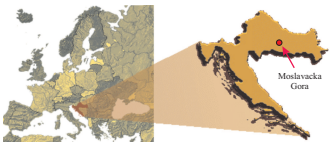
LEUCOGRANITE FROM SREDNJA RIJEKA (MOSLAVACKA GORA, CROATIA)



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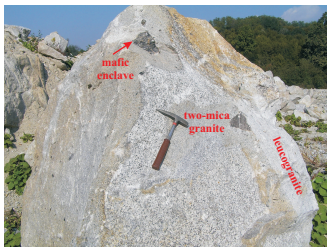
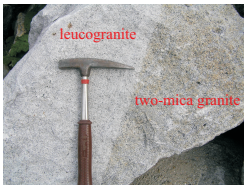
GEOLOGICAL SETTING

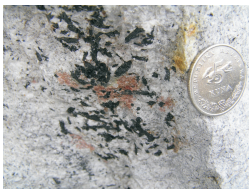
The Mt. Moslavacka Gora represents crystalline crust exposed over an area of 180 km^2 in the southwestern part of the Pannonian Basin. It consists of a S-type granitoid pluton surrounded by migmatites and metamorphic rocks of amphibolite to granulite facies grade. Geochronological data indicate an Late Cretaceous emplacement of the pluton and contemporaneous metamorphism in the country rocks (Lanphere & Pamic, 1992; Garasic, 1993, Balen, 1999; Balen et al., 2001; Starijas et al., 2004).

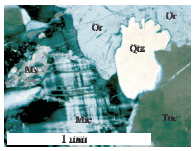
PETROGRAPHY AND MINERALOGY

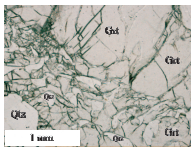




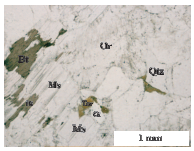
The investigated leucogranite of Srednja Rijeka is located in the northern part of Mt. Moslavacka Gora. It forms dikes within a peraluminous two-mica granite, suggesting an extensional regime during its emplacement. Mafic enclaves are missing in the leucoganite whereas they are present in the two-mica granite. The occurrence of andalusite-garnet-tourmaline nests within the leucogranite is typical.



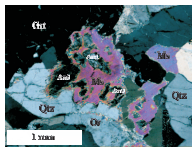




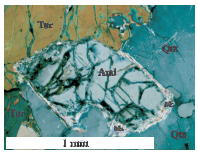
The Leucogranite is fine to medium grained and characterized by subequal proportions of quartz, K-feldspar and plagioclase and variable contents of muscovite, biotite, garnet, andalusite and tourmaline. Quartz is strained, the contacts between single grains are lobate. It occurs as individual grains, but also as intergrows with garnet. K-feldspar (microcline and orthoclase) commonly displays perthitic exsolutions. Plagioclase ranges in the composition from Ab_{93} to Ab_{95}.



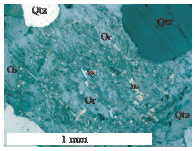
A-type



B-type

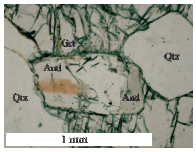


C-type



D-type

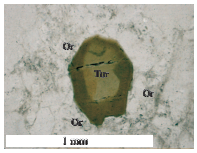
Muscovite and biotite contents are low (up to 2% of the rock volume). Four textural types of muscovite were recognized on the basis of its shape and chemical composition. It occurs as euhedral flakes intergrown with biotite (A-type), as single grains overgrowing andalusite (B-type), as polycrystalline muscovite aggregates replacing andalusite (C-type), and as secondary small platy crystals growing at the expence of feldspar (D-type). The contents of TiO_2, Fe_2O_3 and MgO in muscovite decreases from A to D-type. Biotite occures as single pleochroitic reddish brown flakes or intergrows with A-type of muscovite. It is classified as annite and has high Ti (0.152-0.183 apfu) and Al contents. The consistently high Al^{IV} in the biotite (2.65-2.9) indicate its equilibrium with an Al-rich phase. This is additionally supported by its high MnO content (0.61-0.84 wt.%).



Andalusite occurs as euhedral to subhedral grains rimmed by muscovite or as inclusion within garnet and tourmaline. The content of Fe^{3+} decreases from the pinkish core (0.011 apfu) to colourless rim (0.007 apfu).

Garnet is anhedral, interstitial and the rims are often intergrown with quartz. It is compositionally homogeneous (XFe = 0.6; XMn =0.4) and except rare andalusite crystals it is inclusion free.

Tourmaline occurs as euhedral, but also as anhedral interstitial grains rarely containing andalusite inclusions. It is schorl-foitite in composition and is chemical zoned with Na^+ and F^- contents increasing from the core (0.488; 0.287 apfu) towards the rim (0.623; 0.389 apfu).



ROCK CHEMISTRY

Main elements

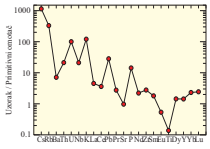
- Strongly peraluminous (ASI = 1.25)
- Wt.% SiO_2 (75)
- Low concentrations
  - Wt.% Fe_2O_3 (0.71-0.79)
  - Wt.% MgO (0.06-0.08)
  - Wt.% CaO (0.45-0.55)
  - Wt.% TiO_2 (0.03-0.05)

Isotopes

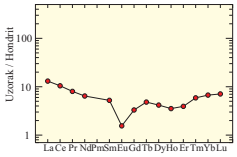
- 143Nd / 144Nd 0.512255+/-8
- Nd at 80 Ma 7.4

Trace elements

- Low content
  - Ba (7-50 ppm)
  - Sr (4-21 ppm)
  - Zr (31-44 ppm)
  - REE
  - Low Sr/Ba (0.4-0.5)
- High content
  - Rb (209-234 ppm)
  - High Rb/Ba (4-36)
  - High Rb/Sr (10-67)
  - Point to K-feldspar rich melting residue and muscovite dehydration melting at low aH_2O



Trace element concentrations normalized to the composition of primitive mantle.



Chondrite C1-normalized REE patern.

Prominent negative Eu anomaly (Eu/Eu* = 0.09)

Point to Zircon and monazite retention in the residue

Field relations mineral assemblage rock chemistry

Point to

- **MPG type granitoid**
- **Formation by melting of continental crust in a collisional environment**

CONCLUSIONS

The leucogranite from Srednja Rijeka represents the final magmatic phase in Moslavacka Gora. It intruded a Late Cretaceous two mica-granite.

Due to the chemical and isotopic data the leucogranite formed by melting of continental crust in a collisional environment.

It can be classified as a MPG type granitoid (muscovite-bearing peraluminous granite).

Based on the mineral composition with andalusite and the contemperaneous high temperature / low pressure imprint of the country rocks the leucogranite took place in a regime characterised by a high geothermal gradient. Therefore the formation of the leucogranite may be related to fast exhumation and contemporaneous decompression melting.

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