High-temperature acid magmatic rocks from the Late Cretaceous suture zone between European plate and Adria microplate (Croatia)

Petra Schneider and Dražen Balen
Department of Geology, Faculty of Science, University of Zagreb, Zagreb, Croatia (pschneider@geol.pmf.hr; drbalen@geol.pmf.hr)

The Late Cretaceous magmatic rocks within the southwestern part of the Pannonian Basin basement (Croatia) occur in two areas: Voćin volcanic mass (VVM) at the northwestern part of Mt. Papuk (near town of Voćin, covering the area of ~10 km²) and volcanic mass of Mt. Požeška Gora (PVM, area of ~30 km²). Both volcanic masses consist of basalts and rhyolites, and in lesser extent of pyroclastic material. Granite can be found it the PVM. Interconnection of this two masses and Late Cretaceous ages have been proposed based on the petrography and mineralogical features of previously studied samples and rather arguable data: K-Ar dating on basalts from VVM (~73−52 Ma) and Rb-Sr isochron age on granite and rhyolite from PVM (~72 Ma). The age has been recently refined with the zircon LA-ICP-MS age dating (~82 Ma), but the magma source of this bimodal formation, geotectonic position, setting and its regional importance still have not been explained in detail.

In order to conduct preliminary research, two localities with acid effusive rocks were sampled from the VVM (Rupnica geosite and Trešnjevica quarry), and three more from PVM (near the village of Vesela, Pakao Creek and the granite from quarry near the village of Gradski Vrhovci).

Acid rocks are characterized by a highly siliceous composition (up to 75 wt.% SiO₂), enrichment in alkalis (high-K calc-alkaline towards to shoshonite series) and aluminium (peraluminous affinity), followed by high FeO_T/(FeO_T+MgO) ratios matching ferroan magmas. They classify as rhyolites or alkali-rhyolites/granite. Microelements including REE show that studied rocks have characteristics of A2-type of post-collisional/post-orogenic acid rocks, most common A-type of rocks formed during rifting caused by extension and thinning of continental crust. According to geotectonic classification diagrams, rocks from PVM show geochemical signature of volcanic arc, while VVM shows signature of within plate environment.

External zircon morphology seems to be uniform with prevailing J3−J5-type for rhyolites and D-type for granite and with average ratio of 2.2:1. Those types are characteristic for the high-temperature magmas (confirmed with the calculated Zr-saturation temperature of 850–930°C) originating from the lower crust or even upper mantle. Inclusions of hematite, F-apatite and anatase have been detected with Raman spectrometry in zircon from all samples, with the most significant findings of kumdykolite and kokchetavite inclusions detected in samples from Vesela and Gradski Vrhovci. Latter inclusions are metastable phases crystallized from enclosed melt and
are indicators of a rapid cooling of the host magma.

According to the results presented here, acid rocks show rather uniform geochemistry, which speaks in favor of the early ideas of the unique magmatic complex, although today at the surface they are separated by ~35 km in distance. Those rocks show potential to be of great regional importance bearing new information about the evolution in the Late Cretaceous in the area of Sava Zone, a suture zone between Tisia Mega-Unit (European plate) and Adria microplate, which spatially and temporally marks the closure of the Neotethys Ocean.

Support by the Croatian Science Foundation (IP-2014-09-9541) is acknowledged.