Gabbro olistoliths from the Mts. Kalnik and Ivanščica ophiolite mélanges in the NW Dinaric-Vardar ophiolite zone (Croatia)

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Mts. Kalnik and Ivanščica ophiolite mélanges vestige for the Repno oceanic domain (ROD), a discrete domain of Neo-Tethys that connects Meliata with Dinaric-Vardar oceanic systems. The domain exposes ophiolitic rocks in four mélange sectors: Mts. Ivanščica, Kalnik, Medvednica and Samoborska Gora. The large gabbro blocks are relatively more abundant in the Kalnik and Ivanščica Mts. mélange sectors, mostly exposed as fault-bounded tectonic inclusions incorporated during ophiolite/mélange emplacement. The preliminary results on petrography, mineral chemistry and bulk rock chemical composition of the gabbro olistoliths are presented and interpreted.

Three mineralogical and geochemical gabbro groups could be distinguished (A, B and C). The gabbros of group A and B show isotropic texture whilst those of group C are coarse grained intergranular. The gabbros of group A are bimineral, composed of plagioclase and augite, the gabbros of group B additionally contain significant but variable amount of edenitic amphibole, whilst edenite represents an additional minor phase in group C. The clinopyroxene from the gabbros is augite (Wo36.5-44.7En29.8-47.7Fs11.0-29.7). Magmatic plagioclase preserved in the rocks of groups B and C shows continuous normal zoning patterns with maximum core to rim compositional range of An41.5-33.7. Edenite textural position and the high content of TiO_2, Al_2O_3 and Na_2O (up to 2.5, 8.3 and 2.7wt.%, respectively) suggest its igneous origin (cotectic with augite). Ilmenite and apatite occur as accessory minerals in all three groups. The C group gabbros contain discrete domains of parallel oriented ilmenite plates (up to 35µm wide) exsolved from a completely decomposed ferromagnesian mineral. A significant chemical difference with respect to the Mn-content of ilmenite was measured between rocks of group B and C (7.82-7.96wt.% vs. 3.28-4.67wt.% MnO). The representative gabbro from group A contains low-Mn ilmenite (< 1.5wt.% MnO) typical of ocean ridge gabbros.

All gabbros are in part altered. The most prominent alteration is transformation of plagioclase to albite and/or peristerite. Less intensive are alterations of augite and edenite to ferro-anthophyllite and/or magnesiohornblende, ferrohornblende, ferroactinolite, actinolite. Other secondary minerals are sericite, calcite, prehnite, diabantite-brunsvigitic chlorite, epidote, leucoxene, high-Al and -Fe titanite, low-Mg stilpnomelane (Mg#=0.20-0.22; K=0.21-0.72 a.p.f.u.) and high-Al pumpellyite, typical of greenschist facies hydrothermal alteration.
Analysed gabbros discriminated into three geochemical groups: (A) N-MORB-type gabbros with slight subduction signatures [(Th/Nb)n=1.80-2.07; (Nb/La)n=0.85-0.90], (B) IAT-type edenite gabbros with clear supra-subduction characteristics [(Th/Nb)n=4.41-5.10; (Nb/La)n=0.41-0.53], and (C) BABB-type gabbros [(Th/Nb)n=2.86-4.04; (Nb/La)n=0.57-0.75]. The representative rocks of the groups A, B and C dated to Early Jurassic, Late Jurassic and to the Cretaceous era, respectively. Early Jurassic gabbros reflect a peculiar stage of Palaeo-Tethyan slab break-off, Late Jurassic gabbros vestige a nascent intra-oceanic arc, and Cretaceous gabbros indicate the existence of magmatism in the back-arc marginal basin. The analyzed gabbroic rocks enable a refinement and completion of the geodynamic evolution of the ROD.