

Textural and geochemical record of interaction between enriched mantle magmas and crustal components in the Montnegre mafic complex (Catalan Coastal Ranges)

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Olivine hornblendites, hornblende gabbros, leucogabbros and hornblende biotite quartz diorites form small stocks and enclaves scattered at the contact between post-tectonic I-type Variscan granitoids and metamorphic country rocks of the Montnegre massif. Field relationships indicate that the intrusion of the mafic complex (MC) and the granitoids are broadly coeval and result in complex mingled zoned between dioritic rocks and granodiorites. The granitoids and the MC rocks define a calc-alkaline trend that straddles the boundary between medium and high-K types.

Olivine is pseudomorphosed by phlogopite-pleonaste±amphibole in hornblendites. These and the diorites have clino and orthopyroxene, but the latter is lacking in gabbros. Crystal zoning with contrasted concentrations of Ti and trace elements is observed in amphibole of hornblendites and gabbros. Clinopyroxene REE patterns are similar in all rocks but leucogabbros. An-content in plagioclase of gabbros is 91-84% and ranges from 90 to 35% in zoned crystals of diorites. There is a significant gap in SiO₂ abundance between gabbros and diorites, but the M number decreases and incompatible trace element concentrations increase gradually from hornblendites to diorites. All MC rocks have very evolved and varied Sr and Nd isotopic compositions.

Different basic magma batches were involved in the formation of the MC. They experienced fractional crystallization under high P_{H₂O}, in an open system. Crustal contamination alone cannot account for the geochemical features of the mafic rocks, implying their derivation from a time-integrated enriched mantle source.