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Evidences for Coeval Mafic and Felsic Magma Interactions; Torul, Koprubasi and Sariosman Plutons, NE Turkey

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Many granitoid rocks display evidence for interaction of mafic and felsic magmas during their genesis. At this study, evidence of magma mixing and mingling is investigated in the Upper Cretaceous-Eocene aged granitic batholiths in the Gumushane region of the Eastern Pontides.

The Torul (43-85 Ma), Koprubasi and Sariosman Plutons evidence for magma mixing and mingling at both outcrop and thin-section. The magma mixing at outcrop is 0-16 cm in diameter, ellipsoidal shaped mafic microgranular enclaves. In addition to this, magma mingling at thin-section are anti-rapakivi texture, poikitic texture (small plagioclase, hornblende and biotite inclusions in large plagioclase crystals; small plagioclase, hornblende and biotite inclusions in large quartz crystals; small plagioclase and biotite inclusions in large hornblende crystals; small plagioclase and hornblende inclusions in large biotite crystals), acicular hornblende, blade and acicular biotite, acicular apatite, small plagioclase inclusions in large oligoclase-andezine crystals and plagioclase phenocrysts in mafic microgranuler enclaves. Besides textural features, there are syn-plutonic mafic dyke at the Torul Pluton.

These plutons are generally I-type, calc-alkaline, metalumineous-peralumineous and show characteristic of cafemic group granitoids, suggesting hybrid source derived mixing of sialic and mantle sources. However, some irregular variations in major and trace elements may be result of magma mixing. $^{87}Sr/^{86}Sr$ ratio (0.70504) of the Torul Pluton also confirms a hybrid magma, which derived from mixing of mantle source with crustal component [1].

The same mineral assemblage between host rock and their mafic mafic microgranuler enclaves, similarities of mineral composition and geochemical features, and textural and geochemical evidences indicate that Torul, Koprubasi and Sariosman Plutons show interaction characteristics magma mixing and mingling played an important role during theirs evolution.

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Textural and geochemical features of the magma mixing in the Sarihan and Torul Granitoids, NE-Turkey

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In this study, textural evidence of mafic and felsic magma interactions is investigated in the Upper Cretaceous-Eocene aged granitic batholiths in the Bayburt and Gumushane region of the Eastern Pontides.

Textural features explained by [1] are observed at the studied intrusion. These include anti-rapakivi texture, poikilitic K-feldspar and quartz, lining of hornblende and biotite inclusions in K-feldspar, small plagioclase inclusions in large plagioclase, acicular and lance hornblende, blade biotite, acicular apatite in plagioclase, and prismatic-cellular plagioclase growths. Generally, at the contact of the mafic magmatic enclave with the host granitoid, biotite is mantled by hornblende [2]. This feature is also one of the textural features that indicates mixing of mafic and felsic magma and resulted probably from an increase of temperature in solidifying hybrid magma, as shown below.

These plutons have 65-70% SiO_2, 1.5-3.4% MgO, 4.2-5.9% Na_2O and <1 K_2O/Na_2O. Generally, the plutons are I-type, metaluminous-peraluminous, and show characteristics of cafemic group granitoids, suggesting a hybrid source derived by mixing of sialic and mantle sources. These plutons have calc-alkaline composition and are characterised by a calc-alkaline granodiorite series trend. However, some irregular variations in major and trace elements may be a result of magma mixing. According to tectonic setting discrimination, these plutons are represented as volcanic arc granitoids. $^{87}Sr/^{86}Sr$ ratio (0.70504) of the plutons also confirms a hybrid magma, which derived from mixing of a mantle source with crustal component [3].

Petrographical textures and geochemical features indicate that these granitoids show interaction characteristics of mafic and felsic magmas. These features indicate significant magma mixing processes in the evolutional history of the pluton.

References

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