Low-Temperature-Low-Pressure Mineral Paragenesis of the Lower-Middle Jurassic Volcanics in the Eastern Pontides, NE Turkey

Tülay Bak, Cüneyt Şen, Faruk Aydin, and İbrahim Uysal
Department of Geological Engineering, Karadeniz Technical University, Trabzon, Turkey (csen6161@gmail.com)

The Lower-Middle Jurassic volcanic rocks in the eastern Pontides were formed in a subduction zone under the extensional tectonic regime. These volcanic rocks were experienced seawater alteration during forming. They also were exposed to the burial metamorphism under the Cretaceous and Eocene aged formations. In addition, the Cretaceous and Eocene granitoids cut these volcanic rocks in some places and metamorphosed them. In this study, the mineralogical changes of the volcanic rocks they have experienced since their formation were examined.

Plagioclase (An_{>42}) + augite/diopside (En_{38-52}Wo_{25-46}Fs_{7-25}) + Fe-Ti oxides (Fe^{3+}/(Fe^{3+}+Fe^{2+}) > 0.80) ± magnesiohornblende (Mg/(Mg+Fe^{2+}) > 0.92) are the main rock-forming minerals in these volcanic rocks. Mineralogical traces of seawater alteration are mostly masked by subsequent geological events. However, Na-enrichment of the plagioclases, increased $^{87}/^{86}Sr(i)$ isotope ratios (0.70462 to 0.70611) and some clay minerals, laumontit, analasite minerals, which are observed in the XRD peaks of some samples, refer to the alteration of the seawater. The pumpellyte (Fe^{2}/Fe^{3}+Mg = 0.60-0.90), chlorite (Fe_{total}/Fe^{2+} + Mg = 0.15-0.95), sphene, calcite, dolomite and secondary quartz minerals were formed during burial metamorphism. The Fe-Ti oxides reached the chemical re-equilibrium under the new P-T conditions (magnetite Fe^{3+}/(Fe^{3+}+Fe^{2+}) = 0.40-0.62; ilmenite Fe^{3+}/(Fe^{3+}+Fe^{2+}) = 0.01-0.20). Epidote (Fe^{12}/(Fe^{2+}+Mg) = 0.75-0.95) accompany the mineral paragenesis in some areas affected by Upper Cretaceous and Eocene granitoids.

Temperature estimations using the chlorite geothermometer and the phase relationships on the P-T diagrams show that the volcanics were heated up above 200°C in the buried areas where the granitoids were not effective. The temperatures were above 250°C in the areas where the magmatic rocks were effective. Taking into consideration the thickness of the formations that overlie the Jurassic volcanics, it can be suggested that the pressure affecting the Jurassic volcanics reached up to 1.5 kilobars.

Acknowledgement

This work was financially supported by Scientific and Research Projects Unit of Karadeniz Technical University with grant # 8920.

How to cite: Bak, T., Şen, C., Aydin, F., and Uysal, İ.: Low-Temperature-Low-Pressure Mineral