Geochemistry and thermodynamic modelling of low-grade metasedimentary rocks from the Sakar-Strandja region, SE Bulgaria

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Carbonate-silicate metasedimentary rocks of Triassic protolith age from the Sakar-Strandja region were affected by low-grade metamorphism in the frame of the Maritsa shear zone, which separates two first-order units of the Balkan orogenic system - Rhodopes and Srednogorie zones. The metamorphism was contemporaneous with strike-slip deformation and ductile shearing. We focus attention on whole-rock and mineral chemistry for better understanding of protoliths origin and metamorphic evolution. The major minerals assemblage comprises calcite, dolomite quartz and white mica in variable proportions, minor chlorite, feldspars and rarely biotite. The accessory phases are ilmenite, rutile, monazite and zircon. Most of the samples show well-defined foliation. The siliciclastic component corresponds to shale, wacke or arkose origin and suggests a quartzose sedimentary provenance. The majority of trace elements tend to incorporate in silicate minerals, while Sr shows pronounced preference for calcite. Chondrite normalized REE patterns correspond to continental crust. Immobile elements (La, Th, Sc, Zr, Ti) used for discrimination of tectonic regimes suggest continental island arc setting for the siliciclastic component origin. The P-T pseudosections (Perple_X 6.7.4, Connolly, 1990) combined with observed mineral assemblages and mineral chemistry isopleths of white mica, chlorite and plagioclase correspond to metamorphism in the range 200-400°C and 0.2-0.4 GPa. The results are supported by chlorite solid solution geothermometer. The thermodynamic modelling corroborates petrographic observations and confirms metamorphism at greenschist facies. Geochemical data suggest protoliths origin due to shallow marine terrigenous-carbonate sedimentation with a provenance of typical upper continental crustal composition at continental island arc tectonic settings