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Deformation microstructures and fluid-related features in the Dorozsma marble (Tisza Mega-Unit, S Hungary) - preliminary results

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The central depression of the Pannonian Basin is the Great Hungarian Plain where the deep subbasins are separated by uplifted crystalline basement highs. The Algyő High (Tisza Mega-Unit), including the Dorozsma block, is dominantly built up by metapelitic and metabasic rocks of the Békés–Codru Unit. One of the most important characteristic features of this area is the occurrence of a marble and dolomite marble cataclasite unit, strongly related to a low-angle shear zone. Recently, uppermost parts of the Algyő High have been included into the Biharia Nappe System. In the Apuseni Mountains, between the Codru and Biharia Nappe Systems, a shear zone with low-grade mylonites was distinguished (Highiş–Biharia Shear Zone). That is why understanding the lithological framework in the Dorozsma fractured marble zone is crucial and requires a detailed study of mineralogy, petrology and microstructure of the given rock type.

A petrographic study of thin sections representing the abovementioned marble zone was carried out from the boreholes of Dorozsma–4, Dorozsma–7 and Dorozsma–54. The fine-grained marble samples show heteroblastic textures with the composition of carbonate+quartz+muscovite+Mg-chlorite±talc. The carbonate crystal boundaries are dominantly sutured, embayed and rarely curved. All the morphological types of deformation twins appear in the samples, but dominantly twin types II and IV are present. The characteristic features of the samples are small dissolution cavities filled with fine crystalline carbonate, blocky quartz and, in some cases, with saddle dolomite. In the samples from the borehole Dorozsma–4 small, inclusion free carbonate grains substitute the deformation twins of the large carbonate crystals. In addition, small carbonate neoblasts, Mg-chlorite flakes and, in some cases, talc also can be found among the large carbonate crystals. Characteristic microstructure of the samples from well Dorozsma–7 are large sigmoid carbonate clasts in a microcrystalline, structureless carbonate matrix. The deformation twins of the clasts can be easily identified but they show signs of recrystallization. These samples also contain irregularly shaped polycrystalline quartz grains with dissolved edges, undulose extinction and signs of incipient dynamic recrystallization. The microstructures presented above provide an evidence for ductile deformation with a shearing component. The structureless fabric of the very fine-grained matrix and the sigmoid carbonate clasts suggest that the main mechanism of the deformation was probably the grain boundary sliding during hydrolytic weakening.

The microstructures of the studied marble samples suggest a polyphase deformation. The D1 deformation event took place above 250 °C based on the relict microstructures. The subsequent D2 ductile deformation event was a low-temperature dynamic recrystallization with a simple shearing component, which could be the result of a hydrolitic weakening effect of hydrothermal fluids during deformation of the Dorozsma marble. Presumably this hydrothermal fluid during the D2 deformation event created the silicate phases identified in the studied marble samples, so in this case talc cannot be use as a metamorphic index mineral.

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