

2003 Seattle Annual Meeting (November 2–5, 2003)

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DEFORMATION RECORDED BY ARAGONITE PSEUDOMORPHS IN HIGH PRESSURE MARBLES OF SYROS, GREECE

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Aragonite is the stable calcium carbonate mineral during metamorphism at blueschist to eclogite facies conditions, but it is rare in high-pressure marbles because it commonly transforms to calcite during exhumation. Although marbles on the island of Syros (Cyclades, Greece) contain blueschist to eclogite facies mineral assemblages, no aragonite has been identified there. However, we interpret the ubiquitous presence of oriented, acicular calcite textures as calcite pseudomorphs after aragonite. These textures are defined by numerous rod-shaped calcite crystals. The rods show a shape-preferred orientation, and the long axes of the rods are oriented at a large angle to foliation defined by white mica. The crystals also have a crystallographic-preferred orientation: calcite c-axes are oriented parallel to the long axes of the rods. Based on their chemical composition, shape, and occurrence in high-pressure marbles, these calcite crystals are interpreted as topotactic pseudomorphs after aragonite that developed a crystallographic-preferred orientation during peak metamorphism. This interpretation is consistent with deformation of aragonite by dislocation creep, which has been observed in laboratory experiments but has not been previously reported on the basis of field evidence. Subsequent to the high-pressure deformation of the aragonite marbles, the aragonite recrystallized statically into coarse rod-shaped crystals, maintaining the crystallographic orientation developed during deformation. During later exhumation, aragonite reverted to calcite, and the marbles experienced little further deformation, at least in the pseudomorph-rich layers. Some shearing of pseudomorph-bearing marble layers did occur and is indicated by twinning of calcite and by a variable inclination of the pseudomorphs relative to foliation. The orientation of pseudomorph rods with respect to foliation may provide a useful indicator of the sense-of-shear associated with exhumation.

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