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PROGRADE LAWSONITE PSEUDOMORPHS IN BLUESCHISTS FROM SYROS, GREECE

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The island of Syros is made of a suite of glaucophane-bearing calcareous schists, mafic schists, and marbles. Lawsonite pseudomorphs stand in relief on the weathered surfaces of a number of blueschist outcrops on the island. They occur as white, seemingly euhedral, rectangular or diamond-shaped aggregates, 0.2 to 3.0 cm across. The pseudomorphs, some of which contain remnant lawsonite, consist mainly of a fine-grained mixture of zoisite and phengite with other minerals such as chlorite and/or albite. The blueschist matrix assemblage for the pseudomorphs is typically glaucophane + epidote + phengite $\pm$ garnet $\pm$ omphacite $\pm$ rutile $\pm$ titanite in rocks with the bulk composition of basalt. Pseudomorphs also occur commonly in graphitic, calcareous schists. Because many of the pseudomorphs contain phengite, whereas stoichiometric lawsonite contains no potassium or magnesium, these pseudomorphs require mass transfer on at least a cm scale. The abundance of lawsonite pseudomorphs on Syros and in other blueschist terranes suggests that the pseudomorphing process can occur as a part of normal blueschist evolution without any special circumstances such as potassium addition by an infiltrating fluid.

We believe that the source of the potassium is matrix phengite and that the pseudomorphs are the result of a reaction such as: lawsonite + celadonite=zoisite + muscovite + chlorite + quartz + water or lawsonite + celadonite=zoisite + muscovite + tremolite + quartz + water in which matrix phengite is consumed to produce more muscovite-rich phengite in the pseudomorph. A possible alternative reaction, lawsonite + glaucophane=zoisite + paragonite + chlorite + quartz + water, would require an ionic reaction mechanism (Carmichael, 1969) to consume phengite in the matrix and to grow it in the pseudomorph. All of these are prograde, dehydration reactions (with a positive slope on a P-T diagram) that could occur as the rock is heated from about 450 to 500°C at 1.5 GPa. The presence of prograde reaction products as lawsonite pseudomorphs is believed to be the result of the relative immobility of Al in these rocks.

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