Lawsonite Composition and Fabric at the Slab-Mantle Interface

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Lawsonite (Lws) is a hydrous mineral that is important in volatile and element cycles in subducted crust: it may comprise as much as 20-40% of high-P–low-T metabasaltic and metasedimentary rocks and is a significant reservoir of trace elements (REE, Sr, Pb, Th, U) and some transition metals (Cr, Fe, Ti). Lws-bearing rocks may also influence the rheology of subducted crust, and deformation associated with Lws dehydration has been invoked as a driver of some slab earthquakes. An important question is whether element substitution in Lws affects its stability and deformation behavior and therefore the dynamics of subduction zones and the transport of elements from the slab to the mantle wedge. To evaluate this question we have conducted an integrated compositional and microstructural/fabric (CPO) study of the Lws-bearing rocks of Sivrihisar, Turkey: one of the few places in the world where pristine Lws has survived unaltered in eclogite during exhumation. Initial results show that the trace element affinity of Lws, as well as its petrofabric/CPO, vary with rock type/mineral assemblage. For example, Sr and Pb contents in Lws vary with rock type: Sr/Pb is low in metasedimentary rocks and higher in metabasalts. Within each sample, there is a complex relation between deformation and Lws growth/recrystallization. Although Lws typically rotates as a semi-rigid ‘clast’ in a weaker matrix, in some cases deformation has influenced Lws zoning. Furthermore, Lws CPO may vary as a function of compositional factors that affect Lws shape (preferred growth directions), size, mode, and distribution. Ongoing work evaluates the effect of composition and mode on CPO (and therefore seismic properties of subducted crust) and the significance of trace element abundance and zoning for subduction zone metamorphism and deformation.