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Microstructural and chemical evolution of pyroxene during the hydration of granulite to eclogite.

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The progressive transition from granulite to eclogite has been studied from a sequence of samples taken across an interface between the two metamorphic facies assemblages. The granulite foliation is preserved into the eclogite suggesting that no appreciable deformation is associated with the metamorphic reactions. Prior to the formation of eclogite the granulite shows extensive evidence for hydration with the formation of dense needles of zoisite within the plagioclase, sodic amphibole lamellae within the diopsidic pyroxene and grain-boundary reactions producing K-rich phases. The coarsening of the amphibole lamellae nearer to the eclogite boundary is accompanied by progressive Na-enrichment in the pyroxene. The transition from diopsidic to omphacitic pyroxene takes place via a sequence that involves the replacement of the lamellar pyroxene-amphibole intergrowth by a sodic pyroxene-amphibole symplectite and the eventual resorption of the amphibole and is spatially related to the breakdown of the plagioclase. The evolution of the microstructure argues against the plagioclase-zoisite and the pyroxene-amphibole intergrowths being a consequence of post-eclogite hydration during uplift. The implications in terms of stress variations and mass transport across the granulite-eclogite interface and/or metastable metamorphic reactions will be discussed.