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Jadeitite and various types of jadeite-bearing rocks from the Dominican Republic: implications from new discoveries and observations.

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The Rio San Juan Complex of the northern Dominican Republic is composed of subduction-related intermediate to mafic metavolcanic schists and associated voluminous serpentinite mélanges. Within these mélanges we have sampled a huge variety of jadeitites and different jadeite-bearing rocks. These occur as blocks in surficial lag deposits and as boulders in river beds, but, in contrast to most other occurrences in the world, also as concordant layers or discordant veins in blocks of jadeite±lawsonite blueschist hosts. Most of the jadeitites world-wide are now thought to have formed due to fluid-rock interaction within a subduction-related environment. Thus our focus on the jadeitites from the Rio San Juan Complex is to be seen in the context of such an origin from an aqueous high-pressure fluid.

It is possible to distinguish two suites of jadeite-rich rocks: the first comprises transitional rock types between the "end-members" jadeitite s.str. (>90 vol% jadeite, quartz-bearing), jadeite quartzite (JQ) and jadeite-lawsonite quartzite (JLQ). The amount of jadeite in JQ and JLQ varies between 1 and 65 vol%; that of lawsonite can reach 20 vol%. The rocks of this suite can occur as discrete blocks/boulders and as concordant layers or discordant veins in jadeite±lawsonite blueschist. The second suite represents blocks/boulders of quartz-free and albite-bearing jadeitite s.str. (>90 vol% jadeite) found in association with blocks/boulders of eclogite and/or blueschist, but so far never in direct contact with the latter. Additional minerals identified in both suites are omphacite, phengite, glaucophane, albite, calcite, epidote, titanite, rutile and zircon.

The sodic clinopyroxenes within the two rock suites exhibit various types of zonation patterns as well as inter- and overgrowth textures. The oscillatory zonation of jadeite crystals observed in thin section and by Cl imaging reflects both variations in the jadeite end-member (Jd_{99-80}) as well as in the trace activator elements, respectively. Omphacites (Jd_{60-40}) occur both as cores or as sharply defined overgrowths in and on sub to euhedral jadeite grains. The generally anhedral jadeite grains of the discordant veins are surrounded by thin rims of omphacite. Some samples also show patchy or oriented intergrowths of jadeite and omphacite. We have calculated phase relationships for the system jadeite-diopside-hedenbergite-acmite to elucidate possible growth mechanisms for the observed textures. We conclude that so far none of the observed clinopyroxene intergrowths can be considered to reflect phases coexisting in thermodynamic equilibrium. Thus the crystallization of the jadeitites and jadeite-bearing rocks from a single entrapped high-pressure aqueous fluid in a closed system process seems to be unlikely. Instead, we suggest that these rocks are the open-system crystallization products from pulses of infiltrating fluids with variable compositions. Available data indicate that these crystallization events occurred between temperatures of 350°C to more than 500°C and pressures from 11 to 17 kbar, while spanning almost the entire history of the Rio San Juan subduction zone from 115 to 60 Ma.