D-18: Serpentinization related to Corundum crystallization at Rupaha, Sri Lanka

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Corundum is a mineral that is extensively used in the Sri Lankan gem industry. Although some studies on the sedimentological aspects of gem occurrences have been carried out, the origin of corundum has not been studied in sufficient detail.

The *in-situ* corundum-bearing biotite gneiss and the serpentinite at Rupaha, show a close spatial relationship between corundum formation and serpentinization. The pale- to deep- greenish serpentinite rocks crop out in Halgran Oya, at Rupaha. These rocks are slightly sheared and faulted and occur as a concordant body with semipelitic biotite gneiss. The biotite gneiss contains hexagonal-shaped blue, non-gem quality, porphyroblastic corundum. This corundum is found at 2 localities adjacent to the eastern and western contact zones of the serpentinite with the biotite gneiss. Micaceous minerals and spinel are also found at these contact zones.

Petrological studies suggest that the serpentinite rock was formed from ultrabasic rocks, probably dunite and harzbergite, which have been serpentinized and later partly altered to carbonates. X-ray diffractometry on the structure of the serpentinite show similarities to the composition of lizardite ($Mg_3Si_2O_5(OH)_4$), but the Mg_2^+ and Si_4^+ ions in the lizardite are replaced by Al_3^+ ions in the serpentinite. Analysis of major elements by X-ray fluorescence spectrometry (XRF) confirmed the ion exchange between the serpentinite and the adjacent rocks.

The following processes may be accountable for the origin of the corundum at Rupaha: (a) Serpentinite ultramafic plugs have intruded metapelites in a major shear zone; (b) Metasomatic alteration of surrounding semipelitic rock by ultramafic fluids due to the migration of Al_3^+, Mg_2^+ and SiO_4^+, between one another under the influence of local chemical gradients. Excess of alumina could lead to the growth of porphyroblast corundum in the silica-poor environment at the contact zones and in the semipelitic rock. Crystallization process of corundum had probably taken place during the D4 deformation stage.