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Corundum / Spinel reaction textures in metamorphosed carbonates rocks of Sri Lanka

Corundum and Spinel are considered the most abundant and most important of gem minerals of Sri Lanka. There are instances where corundum and spinel co-exist within the source rock exhibiting a characteristic relationship between the two minerals. These source rocks are mostly carbonate rocks such as skarn, marble and dolomite. This study was undertaken to find the probable reactions considering these macroscopic scale reaction textures and their relations to the source rock.

Corundum crystal with spinel crust is a common occurrence in Sri Lanka. A unique feature of the fresh source rock is the uniform thickness of the spinel crust over the corundum crystal. In this first instance source rock contain both spinel, corundum and phlogopite. In the same rock there are protions with phlogopite in abundance and others with no phlogopite (mica exhausted). A significant feature exists within the areas where thee is no mica. In this case spinel rim around the corundum crystal is not uniform (not perfectly hexagonal) indicating a reaction. Therefore the observations suggest that there is a reaction between corundum and phlogopite to form spinel as the final product. This reaction continuous until all the mica is exhausted. The reaction is as follows.

Reaction- 1- Phlogopite + corundum ----------> spinel + K-feldspar

$KMg_3Si_3AlO_{10}(OH)_2 + 3Al_2O3$ ---------- > $3MgAl_2O_4 + KAiSi_3O_8 + H_2O$

In the second case hexagonal shape corundum crystals were observed in the carbonate rock consisting of a higher amount of plagioclase (31%), therefore corundum/ spinel mixtures and finally spinel confined to a hexagonal outline in the same rock were observed. The reaction textures and the thin section studies suggest the following reaction.

Reaction-2_Corundum ---------->Spinel + phlogopite

The first reaction, unravel a mode of formation of corundum/spinel, where the reaction is a balanced one. Second reaction encountered also happens to be a sequence of formation of corundum/spinel but in this case it is not a balance one because it may have been a open system. Some reaction products have been expelled from the system as fluid or gas. Although both these reactions seem to be very similar, there are differences. In the first case the crystals need not be perfect hexagonals and there is no plagioclase present in the system, while in the second case there is a very high percentage of plagioclase present in the system, while in the second case there is a very high percentage of plagioclase (31%) and all most all the crystals are perfect hexagonals.