

## Sapphires from New Zealand

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The authors recently examined gem corundum from an alluvial deposit on the South Island of New Zealand. The water-worn pebbles (see figure) were found close to Dunedin, during the reworking of an old gold mining area. Thirty samples were studied, ranging from approximately 3 to 8 mm. The 26 rough samples were transparent to translucent pink (18), transparent to translucent orange to orangy pink (5), and translucent blue (3), and the four polished stones were pink (2 faceted), violetish pink (star sapphire cabochon), and pinkish orange (cabochon). All of the stones were examined with the gemological microscope, and selected samples underwent EDXRF and LIBS chemical analysis and UV-Vis and FTIR spectroscopy. In addition, quantitative electron-microprobe analysis was performed on five of the sapphires.

Using a combination of spectroscopic and chemical data, the sapphires could clearly be divided into two types: basaltic and metamorphic. The basaltic sapphires were semitransparent, with rutile inclusions. They showed intense blue coloration and lacked the bluish green appearance that is typical of other basaltic sapphires. UV-Vis spectra were typical of the basaltic type, with a strong Fe<sup>3+</sup> component and no indication of Cr. Analysis of trace elements showed high Fe, Ti, and Ga concentrations, with no or low V and Cr.

The metamorphic sapphires were purplish pink to pink and orange, with UV-Vis spectra dominated by Cr<sup>3+</sup>. The pinkish orange cabochon had spectroscopic features showing Cr<sup>3+</sup> and an additional color center, similar to Sri Lankan padparadscha sapphires. The metamorphic sapphires had low Fe and Ga values and a higher Cr concentration than the basaltic type. The contents of Ti and V were in the same range as in the basaltic sapphires.

In addition to the chemical elements mentioned above, various amounts of the trace elements Na, Mg, K, Ca, Si, and Zr were observed when the sapphires were analyzed by LIBS and the electron microprobe.

The characteristics of the sapphires from New Zealand are in agreement with data from Australian corundum found in the Barrington Tops region (New South Wales) and sapphires from Pailin, Cambodia, as described by Sutherland et al. (1998). Both deposits also produce bimodal corundum suites with basaltic and metamorphic origins.

[Figure caption] Sapphires from the Dunedin area of New Zealand show a wide range of colors. The blue sample is of basaltic origin, while the pink and orange stones are from a metamorphic source. From left to right, the polished samples weigh 0.88 ct, 4.02 ct, 0.65 ct, and 1.04 ct.

## REFERENCE

Sutherland F.L., Schwarz D., Jobbins E.A., Coenraads R.R., Webb G. (1998) Distinctive gem corundum suites from discrete basalt fields: A comparative study of

Barrington, Australia, and West Pailin, Cambodia gemfields. *Journal of Gemmology*, Vol. 26, No. 2, pp. 65–85.