

Petroleum Inclusion in Pink Spinel

Recently, American Gemological Laboratories had the opportunity to examine an unusual 1.69 ct pink spinel that reportedly came from Sri Lanka (Figure 26). Microscopic examination revealed some inclusions commonly seen in spinel, consisting of variously sized octahedral crystals, planar internal growth structures and open fissures. However, most conspicuous was a sizeable two-phase inclusion positioned under the table and in the heart of the stone. The euhedral negative crystal contained a viscous yellow fluid and a spherical bubble (Figure 27, left). As the stone was turned, the bubble slowly moved through the thick yellow fluid. When viewed in a darkened room with long-wave UV radiation (365 nm), the fluid in this inclusion displayed a chalky blue-white reaction underlying the distinct reddish glow of the host spinel (Figure 28, left). Raman analysis could not be used to analyse the fluid due to strong chromium luminescence that swamped the detector. However, focused infrared spectroscopy using a paper mask around the inclusion (Figure 29) identified the fluid as petroleum. The spherical bubble was presumably a gas, although it could have been an immiscible fluid, such as water.

Similar negative crystals are well-known in rock crystal quartz from Baluchistan, Pakistan (see e.g. Koivula, 2008), which contain petroleum and a bubble of methane gas. The petroleum fluid in

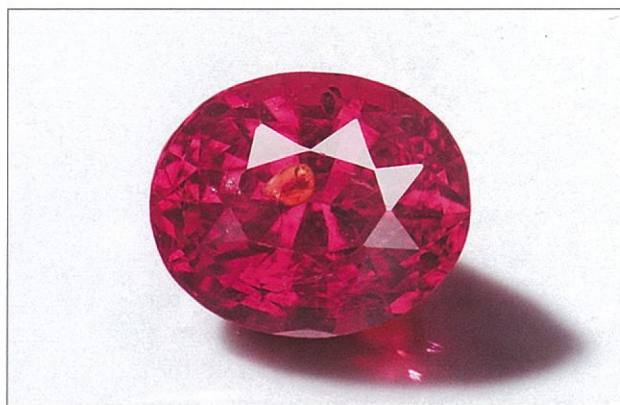


Figure 26: This 1.69 ct pink spinel, reportedly of Sri Lankan origin, contains a unique petroleum-bearing inclusion under the table facet. Photo by Bilal Mahmood.

this spinel has a similar viscous yellow character (see Figure 27, right) and displays the same chalky blue-white long-wave UV reaction (see Figure 28, right) as the petroleum in quartz from Pakistan.

To the authors' knowledge, this is the first time that a petroleum-bearing inclusion has been documented in spinel.

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Reference

Koivula J.I., 2008. Lab Notes: Unusual green fluid inclusions in quartz. *Gems & Gemology*, **44**(2), 161.

Figure 27: Left: The large, two-phase negative crystal in the spinel contains a viscous yellow fluid (petroleum) and a spherical bubble consisting of a gas or immiscible fluid. The bubble could be seen to slowly migrate through the petroleum as the stone was turned. Photomicrograph by M. Chaipaksa; magnified 70×. Right: A similar appearance is displayed by petroleum-filled negative crystals in colourless quartz crystals from Baluchistan, Pakistan. Photomicrograph by C. P. Smith; magnified 24×.

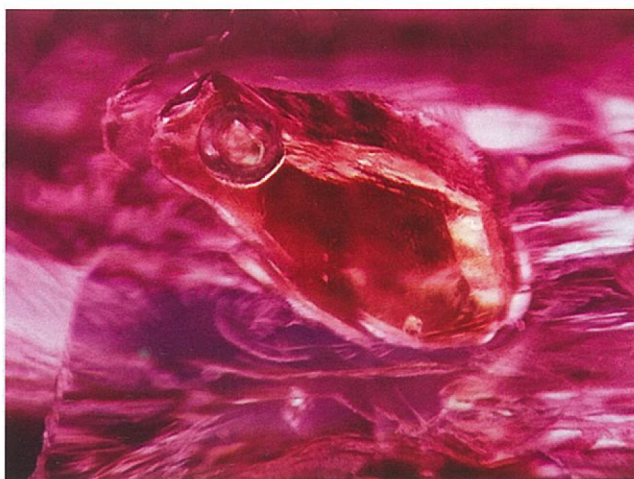




Figure 28: Left: Under long-wave UV radiation (365 nm), the petroleum exhibits a chalky blue-white reaction that was somewhat muted by the dominant red luminescence of the host spinel. Right: Such fluorescence also is displayed by petroleum inclusions in a Pakistani quartz. Photomicrographs by C. P. Smith; magnified 40 \times .

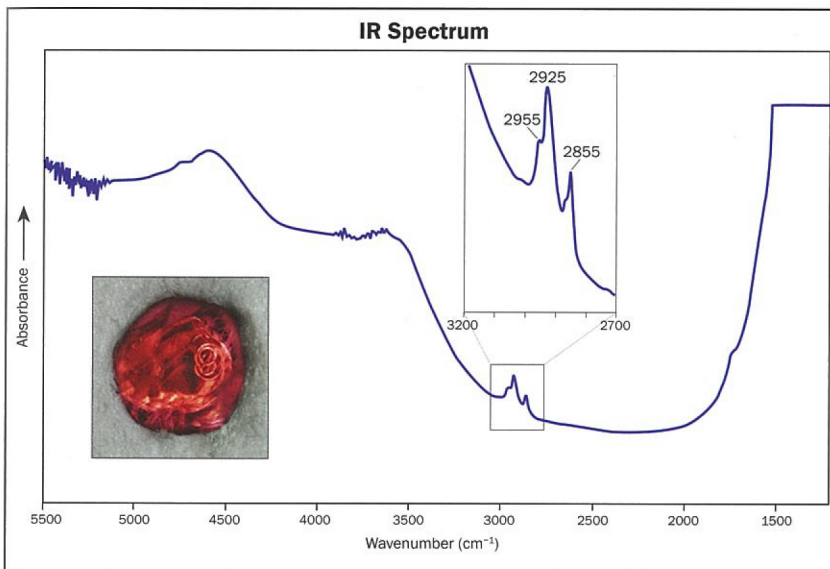


Figure 29: Focused infrared spectroscopy of the negative crystal in the spinel identified the viscous yellow fluid as petroleum, with lines at 2955, 2925 and 2855 cm^{-1} . The inclusion was isolated for the analysis by using a 1.5-mm-wide paper mask (inset photomicrograph by C. P. Smith).