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Photochromic Scapolite from Baffin Island, Canada

Recently, gem miner and dealer Brad Wilson (Alpine Gems, Kingston, Ontario, Canada) provided for examination two faceted photochromic ('tenebrescent') scapolites from the Kimmirut area of Baffin Island, Nunavut, Canada. The stones were mined between 2004 and 2008, from a locality about 5 km north of the Beluga pit, which is where most of the gem corundum from this area has been found (B. Wilson, pers. comm. 2022).

The two stones consist of a 0.56 ct round brilliant and a 0.77 ct triangular cut (Figure 25a). The photochromism was seen as a slight but noticeable change from brownish grey to bluish grey after about two minutes of exposure to short-wave UV radiation (Figure 1b). The colour reverts extremely rapidly, within about three seconds after the UV lamp was turned off. Thus, recording the transient colour with UV-Vis spectroscopy was not possible. The RIs of 1.540–1.560 and SG (2.61–2.63) indicate their composition is mostly marialite, with 20–40% meionite (cf. Pradat 2012). This identity was confirmed by Raman spectroscopy using a Jobin Yvon T64000 dispersive spectrometer, equipped with a 514 nm Ar⁺ green laser and 4 cm⁻¹ resolution. A best fit was obtained using the CrystalSleuth software with marialite R070689 of the RRUFF database, which is 34% meionite. According to the marialite-dominant composition of the scapolite, the main species in the 'cages' of the atomic structure belong to the Na₄Cl group (see, e.g. Blumentritt & Fritsch 2022).

Both stones exhibited bright yellow-orange fluorescence to long-wave UV radiation, with a weaker reaction to short-wave UV. This well-known luminescence is due to the S₂⁻ ion (Blumentritt *et al.* 2020, and references therein) and makes scapolite a favourite of fluorescent-mineral collectors.

The two stones contained many parallel growth tubes of various lengths, some of which were flattened (lath-looking; Figure 26). Also present were negative crystals of different sizes and shapes. Most looked like tubes, while other, generally larger ones, had many small faces. They contained a small bubble (less than 10% of the volume) and a tiny black daughter crystal (again, see Figure 26). The materials contained in these inclusions were too small to be identified by Raman spectroscopy.

Photochromic scapolite is well known from Afghanistan (McClure *et al.* 2005; Allen *et al.* 2014), and it is also marialite but with a distinct change from colourless to blue and a much slower decay time of about 120 seconds (Blumentritt 2021). Nevertheless, there is no reason to believe that the cause of the photochromism is different between the two localities. The change of colour has been attributed to ionization of a chlorine vacancy, possibly related to the presence of sulphur as an impurity (Blumentritt 2021). Because chlorine is involved, this phenomenon should be observable only when Cl-containing marialite dominates the scapolite solid solution.

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Figure 25: These scapolite gemstones (0.56 ct round and 0.77 ct triangular cut) from Baffin Island, Canada, are essentially brownish grey (a) and turn slightly bluer (b) after about two minutes of exposure to short-wave UV radiation. This photochromism decays so fast (about 3 seconds) that it is challenging to photograph. Photos by Philippe Deniard.

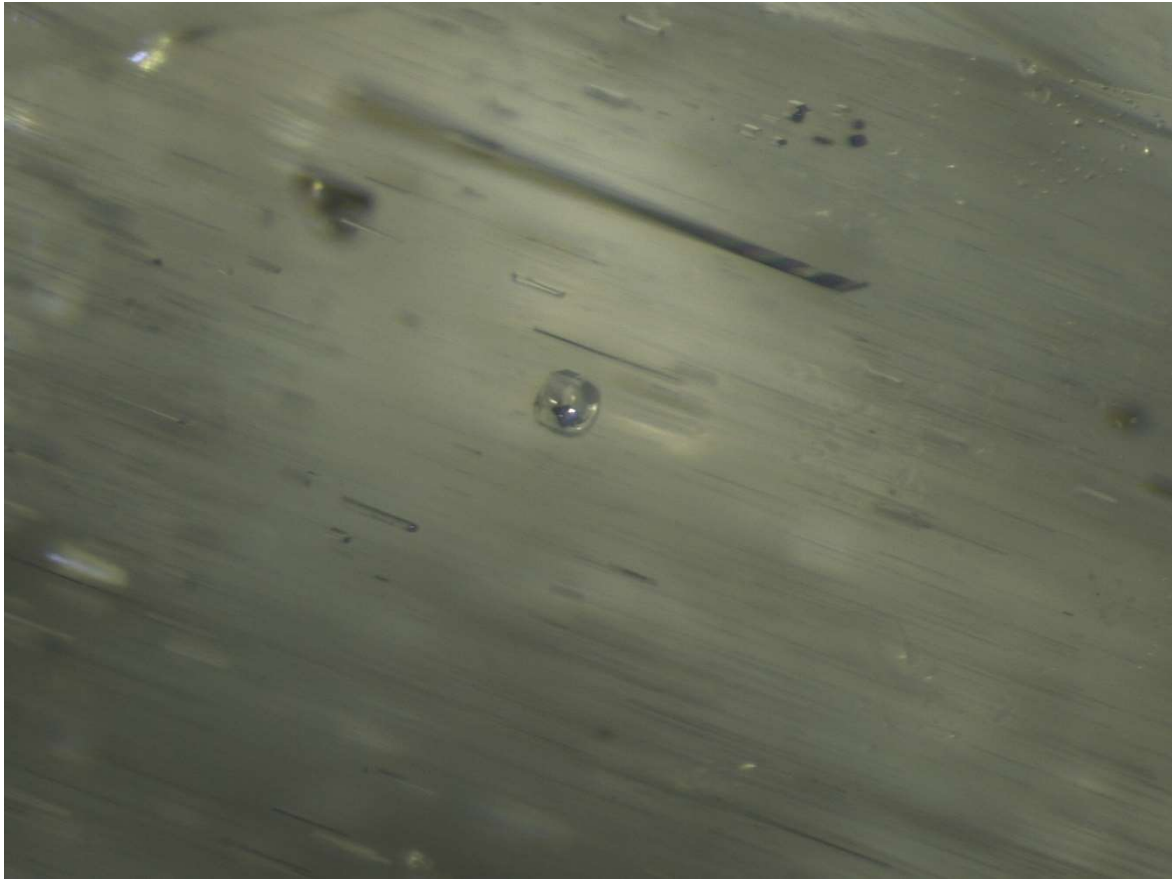


Figure 26: Parallel fluid inclusions (each containing a small bubble) are abundant in the photochromic scapolite. The one in the centre is a larger negative crystal with many faces, in which a black daughter crystal is visible in addition to a bubble. Photomicrograph by E. Fritsch; image width 2 mm.