

Figure 11:
(a) This 2.20 ct opal, reportedly from Hokkaido, Japan, displays prominent banding. (b) Viewed with long-wave UV radiation, the sample demonstrates a vibrant orange reaction in the orange bands, but the thin transparent colourless areas are inert. Photos by B. Williams.

Orange-Fluorescing Common Opal from Japan

During the June 2018 JCK Las Vegas show in Nevada, USA, gem dealer Dudley Blauwet had some interesting banded orange common opal that was notable for exhibiting strong orange fluorescence to long-wave UV excitation. The opal came from the Shikaribetsu Lake area in Kato District, Tokachi Province, Hokkaido, Japan (Okazaki et al., 2014). This region is covered by Daisetsuzan National Park, and contains numerous volcanos and hot springs. The geochemistry of the opal was characterised by Okazaki et al. (2015) and by Kanai et al. (2016). Both studies were unable to find an unambiguous relationship between chemical composition and fluorescence colour, leading the authors to propose that organic compounds may be involved.

Blauwet had four opal cabochons weighing up to 2.20 ct, and he loaned the largest sample for examination (Figure 11a). The stone was cut as a double cabochon and showed prominent, parallel, colour banding ranging from a translucent strong orange to very pale orange with some thin transparent colourless layers (Figure 12). The latter areas were inert to the UV lamp, but the orange areas fluoresced a vibrant orange (Figure 11b), which was stronger to long-wave than to short-wave UV radiation.

The RI of the stone, approximated by the spot method, presence of quartz to provide a reason for the blink.) There was no detectable magnetic susceptibility. No discernible results were obtained by Raman spectroscopy on either the coloured or colourless areas, but the 'fingerprint' region of the Fourier-transform infrared (FTIR) spectrum matched that of opal.

Energy-dispersive X-ray fluorescence spectroscopy with an Amptek X123-SDD spectrometer revealed the presence of minor Ca and traces of Fe, the latter being common in many orange opals. Moderate amounts of Mn were present, as were traces of Th. Using a Geiger counter, we detected low radiation emissions, at only about 1.5× background levels.

Strong orange fluorescence in common (pink) opal has been attributed to organic compounds called quinones (Fritsch et al., 2004), and may indicate the presence of organic material during the opal's formation.

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was ~1.42. Specific gravity was measured hydrostatically as 2.12. Viewed between crossed polarisers, most of the stone remained light upon rotation (consistent with an amorphous structure), and no strain was visible, but the colourless areas blinked dark with every 90° of rotation. (However, we were unable to find any evidence of the

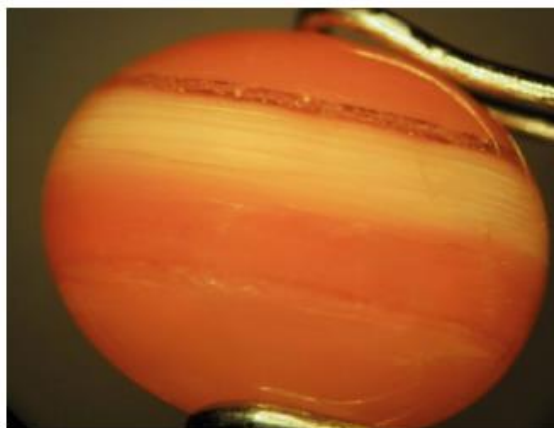


Figure 12: A closer view of the 2.20 ct opal shows the pronounced layered texture. Photo by Dean Brennan, Stone Group Laboratories.

References

- Fritsch E., Gaillou E., Ostroumov M., Rondeau B., Devouard B. and Barreau A., 2004. Relationship between nanostructure and optical absorption in fibrous pink opals from Mexico and Peru. *European Journal of Mineralogy*, **16**(5), 743–751, <http://doi.org/10.1127/0935-1221/2004/0016-0743>.
- Kanai Y., Tachibana Y., Aoki M., Okazaki C., Oppata Y., Mita N. and Matsueda H., 2016. Study on chemical composition of fluorescent opal specimens in the Shikaribetsu area, central Hokkaido. *Bulletin of the Geological Survey of Japan*, **67**(4), 101–110, <http://doi.org/10.9795/bullgsj.67.101> (in Japanese with English abstract).
- Okazaki C., Matsueda H., Aoki M., Kanai Y., Mita N. and Oppata Y., 2014. First report of the fluorescent opal found in the Shikaribetsu volcano area, Hokkaido. *Journal of the Geological Society of Japan*, **120**(11), IX–X, <http://doi.org/10.5575/geosoc.2014.0040> (in Japanese).
- Okazaki C., Matsueda H., Kanai Y., Mita N., Aoki M. and Oppata Y., 2015. Preliminary report on mineralogy and geochemistry of opals from the Shikaribetsu area, central Hokkaido. *Bulletin of the Geological Survey of Japan*, **66**(7/8), 169–178, <https://doi.org/10.9795/bullgsj.66.169> (in Japanese with English abstract).