Lace Opal from Utah

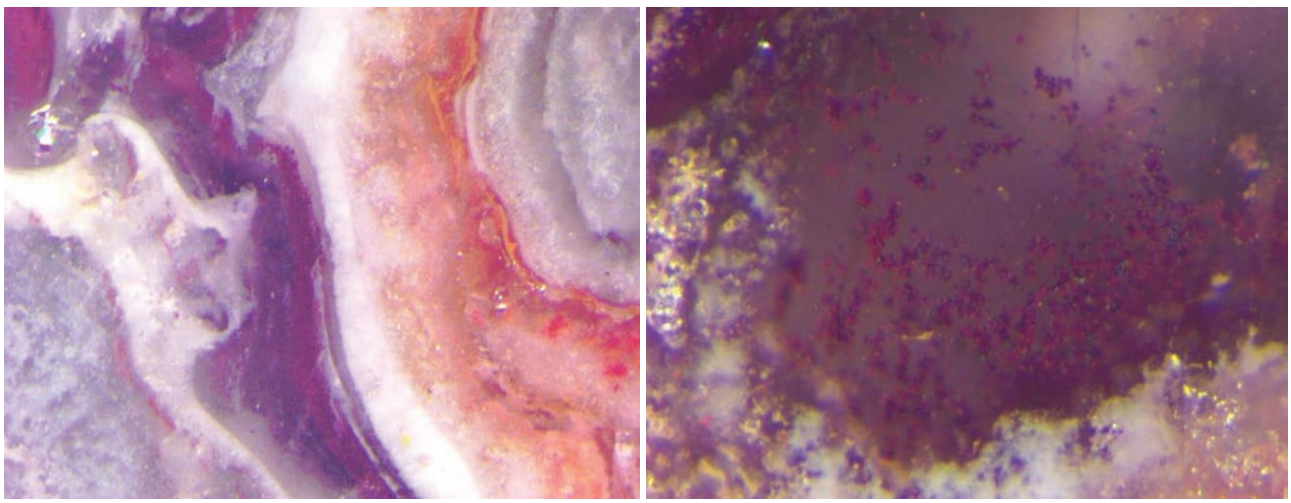
The western USA is a source of both 'common' and play-of-colour varieties of opal. Recently these authors had the opportunity to examine some colourful banded samples marketed as 'Utah Lace Opal' (e.g. Figure 11). They were submitted to two of the authors (CW and BW) for identification and analysis by Larry and Joyce Wright of Aspen Rock and Gem, Cedaredge, Colorado, USA. They have been mining this material since 2008 in Milford County, south-central Utah, but it has yet to be gemmologically characterized.

Three pieces of rough, four polished slabs and three cabochons were examined. Most areas of the samples were opaque to slightly translucent, although some transparent bands were present that were colourless with a crackled appearance. Overall, white-to-grey areas were most common in the samples, and these alternated with purple to orangey red bands, as well as pink and 'mustard'-yellow layers (see Figures 11 and 12). A few of the specimens contained bluish grey bands. According to Mr Wright, the colour range of the material changes every few feet along the vein.

Several areas of each sample were analysed by FTIR spectroscopy (with a PerkinElmer Spectrum100 instrument) and Raman spectroscopy (GemmoRaman-532SG), which revealed that they consisted primarily of opal. Some of the colourless areas showed a 500 cm^{-1} Raman peak indicative of moganite. On two polished samples, spot

Figure 11: Left: These rough (up to ~11 × 7 cm) and cut (58.72 ct cabochon) samples of Utah Lace Opal show a range of colours and patterns. Right: These cabochons of Utah Lace Opal measure 41.4 × 28.61 × 7.14 mm (44.63 ct) and 31.7 × 23.73 × 7.15 mm (29.67 ct). Photos by B. Williams.

Figure 12: Left: Bands consisting mostly of colourless, white, purple and orangey red form well-defined layers in this Utah Lace Opal. Right: The purple band contains clusters of Fe-oxide inclusions within the colourless opal matrix. Photomicrographs by A. U. Falster; image width 3 mm (left) and 0.8 mm (right).



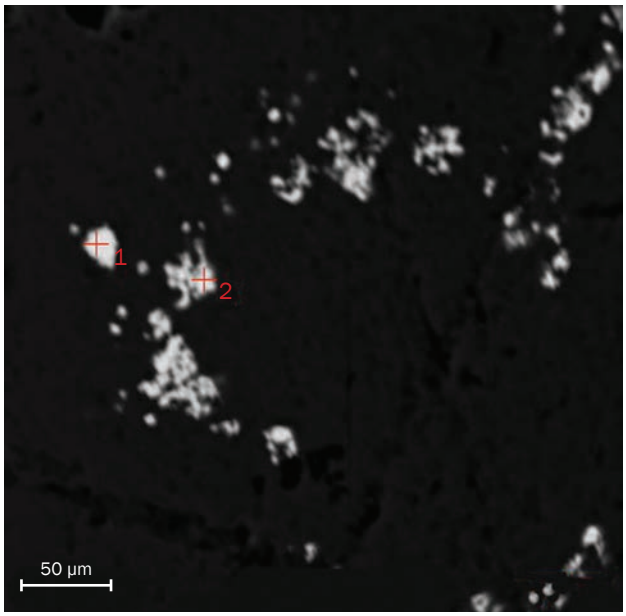


Figure 13: Backscattered-electron imaging of a polished surface of Utah Lace Opal shows bright-appearing sulfide inclusions. Approximately 20% of them consisted of an unidentified antimony thallium sulfide (e.g. spots 1 and 2), and the remainder were pyrite or marcasite. Image by A. U. Falster.

RI readings of 1.43 and 1.44 were obtained, and hydrostatic SG was measured as 2.08. Chemical analysis with an Amptek X123-SDD EDXRF spectrometer indicated the main impurities consisted of Fe, Mn, Ti, Ca and K. Iron was present in the red and yellow areas, and Mn in the black areas. The Ca and K are presumed to be present in the form of feldspar inclusions (see below). Trace amounts of Ni, Zn and Cu also were present.

A JEOL JSM-6400 scanning electron microscope was used to further investigate the composition of one piece of rough and two polished slabs by authors AUF and WBS. Backscattered-electron imaging and energy-dispersive spectroscopy (EDS) were used to analyse various inclusions, including Fe oxides (Figure 12, right), Fe sulphides (pyrite or marcasite; Figure 13) and alkali feldspar. Perhaps the most interesting were blebs of an antimony thallium sulphide (Figure 13). The only mineral species known with this combination of elements is weissbergite, $TlSbS_2$. However, the EDS spectrum indicated that Tl was not present in sufficient amounts, and more work is needed to confirm the identity of these inclusions. Nevertheless, Sb- and Tl-sulfide mineralization is common in a low-temperature hydrothermal environment, consistent with the formation of opal.

Areas of porosity were evident in some of the rough pieces, and the polished samples were brittle and easily broken along their edges. For these reasons, Wright stated that some of the cut material is treated by polymer stabilization, but none of the submitted samples showed indications of any treatment.

The name 'Utah Lace Opal' seems appropriate for this material, as it closely resembles the colourful, intricate, banded appearance seen in so-called lace agates, but tests primarily as common opal.

Cara Williams FGA

Alexander U. Falster and
Dr William B. (Skip) Simmons
Maine Mineral & Gem Museum
Bethel, Maine, USA

Bear Williams FGA

Pollucite from Pakistan with Polylithionite Inclusions

Pollucite, $(Cs,Na)_2(Al_2Si_4O_{12})\cdot 2H_2O$, is an uncommon cesium mineral that is typically colourless or white. It has a Mohs hardness of 6½ but is rarely faceted as a collector's stone since it is very brittle and typically not very transparent. For approximately two decades, the granitic pegmatites in northern Pakistan—particularly in the Shengus area (Blauwet et al., 1997)—have been a source of fine pollucite crystals that are highly valued by mineral collectors.

At the 2015 Tucson gem shows, Dr Marco Campos Venuti (Gems in Gems, Seville, Spain) had faceted pollucite from northern Pakistan that contained interesting clusters of colourless inclusions (e.g. Figure 14). Approximately 0.5 kg of the rough material was obtained in early 2013, and 300–400 carats of stones were faceted that weighed up to ~60 ct (the largest stone present in Tucson weighed 14.31 ct). In November 2014, the inclusions in two samples were analysed by Raman micro-spectroscopy at Geospectra Scientific Solutions (Torrejón del Rey, Spain) and identified as polylithionite, $KLi_2Al(Si_4O_{10})(F,OH)_2$, a lithium-rich mica. The association of Li-rich mi-