What's New With Cobalt?

As an element, cobalt plays various roles in the gem world. It is classified as a transition element, which is typically a color-causing agent or chromophore. Here, we explore cobalt's latest performances.

Fig. 1. Synthetic cobalt spinel (flame fusion).

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By now, we should all be aware of last year's discovery of the use of cobalt coatings to improve the color of Tanzanite. This treatment, as reported by the AGTA-GTC and the AGL (May 23, 2008), shows that a cobalt coating was applied to the pavilion to render the tanzanites a richer blue. (www.agta-gtc.org/coated-tanzanite.htm)

As a radioactive isotope, cobalt-60 is commonly used to irradiate various gems to change their color, sterilize medical supplies, and prolong the shelf life of foods. It is often all done in the same facility. This gamma source of radiation is preferred, as it leaves no residual radioactivity after exposure.

During the 2009 Tucson Gem Show, I stopped at the sight of a bright blue stone. Roger Kuchek (Stone House of Max Schuster, Rochelle Park, NJ) showed me what appeared to be a new synthetic corundum using cobalt as the coloring agent. As the photo shows (Fig.2), this color is markedly distinct from the usual iron-titanium coloring of other synthetic and natural blue sapphire. This sapphire is assumed to be grown using the hydrothermal process, apparent in the roiling effect as well as various small particulate inclusions that can be seen under magnification. Raman tests

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Fig. 2. Synthetic cobalt sapphire (hydrothermal).

Fig. 3. Baffin Island. 30 March 2008. HowStuffWorks.com

Fig. 4. Cobalt spinel rough from Canada.

confirmed this material as being corundum. A cobalt spectrum is readily seen in the spectroscope, and a strong red reaction in the Chelsea filter makes this an easy identification, but do not forget to check the refractive index. Neither synthetic cobalt corundum nor synthetic cobalt spinel show any iron absorptions in their spectra. Who would have expected that we would see hydrothermal corundum?

For many years, the gemological literature indicated that while cobalt might render natural stones red to pinkish, it did not cause blue in any natural gem. In the early 1970s, Sri Lanka surprised us with some beautiful natural blue spinels colored with cobalt. Shigley and Stockton published a detailed paper (*Gems and Gemology*, 1984) covering these spinels and how to identify them; namely, the bit of tell-tale iron absorption in the spectra.

After literally battling with polar bears, geologist Brad Wilson of Alpine Gems spent some time exploring for gems in the Nunavut region of Canada. Last year, on Baffin Island in the Canadian arctic, he found some truly beautiful blue material, which Stone Group Labs received for testing (Fig. 4). We were happy to report that his material showed very clean, strong cobalt reactions in the spectrometers with surprisingly very little trace of iron. Had it not been connected to the host rock, we would have suspected it was synthetic.

When comparing the spectra of this natural material to that of synthetic cobalt spinel, synthetic cobalt corundum or cobalt colored glass, it should be noted that the signature cobalt reactions have slight shifts in their peak absorption and emission coordinates. While spectra can identify cobalt as the coloring agent, other tests and observations should be employed to confirm natural or synthetic origin.

In a world where synthetics and treatments are the norm, it is nice to keep an eye out for the new finds of natural material and how to recognize them. ◆