Studying renowned fancy color diamonds in museum collections: the case of the Winston Red

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Introduction

Museums are unique repositories of international treasures. They are also places of active research, even on the most valuable objects, such as famous and / or historic gemstones and jewels. As part of this approach and of its ongoing interest in unraveling the mysteries behind important diamonds, the Department of Mineral Sciences of the Smithsonian National Museum of Natural History (NMNH) teamed up with the Gemological Institute of America (GIA) and the director of the Mineralogy Museum of Paris School of Mines to investigate its newest and most exceptional acquisition: the 2.33ct Winston Red diamond (Figure 1). The stone was unveiled in a permanent exhibit on April 1, 2025, along with 40 Fancy color diamonds, that were part of a significant donation by Ronald Winston (son of famous jeweler Harry Winston) in December 2023. The study was conducted before the Winston Red went on exhibit, in June 2024. In order to organize for the most comprehensive study, a New York team of GIA set up a temporary gemological laboratory (for a week) in the Department of Mineral Sciences of Smithsonian Institution in Washington D.C. The main purpose of this study was to investigate the origin of the exceptional red color, and accumulate clues to better constrain its geological formation and geographic origin. This article will present the main results from this complete study, along with some behind-the-scenes pictures. In this abstract, only the main conclusions are presented.

Figure 1: Winston Red diamond, graded Fancy Red and weighing 2.33 ct. The old mine brilliant-cut stone measures 8.13 mm in the largest length.
Photo by Robert Weldon; courtesy of Ronald Winston.

History of the Winston Red

If the Winston Red is at this moment known because it is the largest pure red diamond on public display and the fifth largest diamond awarded the Fancy Red color grade, its history can be traced back to 1938. Back then, Jacques Cartier sold the stone to the Maharaja of Nawanagar, Digvijaysinhji, and suggested to set the red stone in a ring or "put in your big necklace between the green diamond and the pink diamond pendeloque [...]. The red diamond would take the place of the white triangular diamond.". The setting in the necklace was chosen. The "big necklace" was referring to the Ceremonial

Necklace of Nawanagar, best known for its cinematographic interpretation in the Ocean's 8 movie (2018): the "Toussaint Necklace" worn by actress Anne Hathaway.

By the early 1960s, the necklace was being dismantled and in 1988, Ronald Winston acquired the red diamond and nicknamed it the "Raj Red". The diamond's debut was at the Harry Winston salon of Tokyo in 1989 and worn in a ring by actress Brooke Shields. The "Raj Red" was donated by Ronald Winston in December 2023, alongside a collection of over 100 fancy color diamonds.

Main results and discussion

In order to study the Winston Red, a variety of equipment was used: optical imaging, FTIR absorption spectroscopy, visible and near infrared (Vis-NIR) spectroscopy, photoluminescence spectroscopy (PL), DiamondView Deep UV fluorescence imaging, all coming from the GIA, and scanning electron microscopy (SEM) equipped with cathodoluminescence imaging (CL) at the Smithsonian Institution.

The Winston Red was previously graded by GIA as a "Fancy Red" diamond, I2, weighing 2.33 ct, measuring 8.13 x 7.95 x 4.91 mm and being cut in an old mine brilliant cut.

First, it is important to note that red diamonds represent a specific saturation of the pink diamond grade (King *et al.*, 2002), we will therefore treat the red diamond as we would for other pink diamonds. The main features of optical observation of the Winston Red revealed a dense red color, heterogeneously distributed: three directions of red thin bands were observed. This color zoning is referred as graining, which has {111} orientation, and represents slip or glide bands created by plastic deformation (Figure 2).

FTIR spectroscopy helped classifying it as a type IaAB (A<B) diamond (Figure 3), with total nitrogen concentration visible by IR at 83 ± 8 ppm, with 76 ± 8 ppm B-centers and 7 ppm A-centers (i.e., 92% IaB). Vis-NIR analyses showed the 550 nm band, usually associated with the pink color and plastic deformation, as well as the nitrogen-related N3 (N_3V^0), H3 (N_2V^0), and H_4 ($N_4V_2^0$) defects.

PL spectroscopy using several laser wavelengths revealed the main following features: a broad band peaking at around 700 nm, possibly the 609 nm system, also visible in absorption, the 490.7nm peak (possibly related to plastic deformation; Collins & Woods, 1982), the H4, the H3, the 576 nm and the 668.7nm emission peaks. Other noticeable features are the 535.8, 654.9, 660.8 and 710 nm peaks. When viewed under the DiamondView, the Winston Red diamond displays a blue fluorescence with a color zoning due to growth features and emanating from the N3 center. After excitation under deep UV, the saturation of the red color decreased temporarily, a photochromic behavior known in pink diamonds in general (e.g., Fisher *et al.*, 2009; Byrne *et al.*, 2012). CL imaging revealed a "fish-scale" pattern related to a dislocation network, seen in low-nitrogen containing diamonds, including some pink diamonds (Gaillou *et al.*, 2010, 2012; Howell *et al.*, 2015).

All of these results show that the Winston Red belongs to the category of Group 1 pink diamonds, with a strong color saturation giving it its red hue (e.g. Gaillou *et al.*, 2010; Eaton-Magaña *et al.*, 2018). This helps narrow down the possible geographic origin of the diamond. Localities that can most likely be excluded are: Russia, Canada, South Africa, Tanzania (because they contain group 2 diamonds, those with discrete color lamellae instead of banding) and India (so far, only type IIa pinks have been reported) (Gaillou *et al.*, 2010, 2012; Howell *et al.*, 2015; Eaton-Magaña *et al.*, 2018). Recognized group 1 pink diamonds are known from Venezuela and from Argyle, but this later locality can also be excluded, as the Winston Red predates the opening of the Argyle mine in the 1980s. Non-classified red diamonds have been reported from Minas Gerais in Brazil, but no comprehensive studies have been done on pink to red diamonds from this locality. It is interesting to note that the 5.11 ct Moussaieff Red diamond cut from a 13.90 ct crystal recovered from an alluvial deposit in Noroeste de Minas, Minas Gerais, Brazil, in the mid-1990s (e.g., King *et al.*, 2002; King and Shigley, 2003). This leads us to conclude that the Winston Red diamond mostly comes from Venezuela or Brazil.

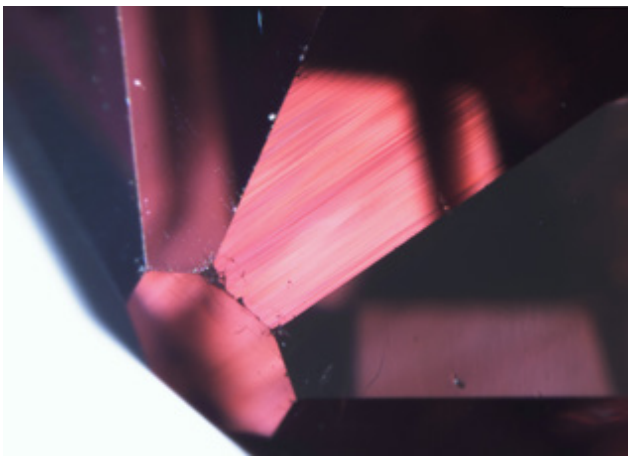

Figure 2: Pink color zoning observed in the Winston Red diamond. Here, only one direction of the banding is visible. Scale bar: 0.5 mm. © GIA / Smithsonian.

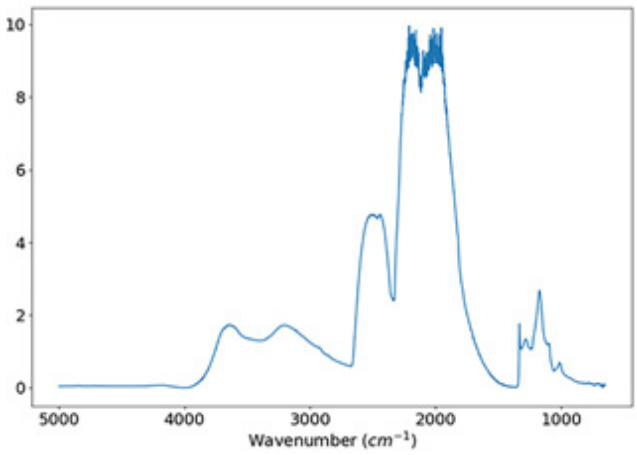

Figure 3: FTIR spectrum of the Winston Red diamond: Type IaA<B, with very small H at 3107 cm^{-1} and Amber Center AC1 at 4167 and 4839 cm^{-1}).

Conclusion

This study highlights the problem of establishing a geographic origin for diamonds, even if for pink to red diamonds, nitrogen content and aggregation along with color distribution help narrow the possibilities down. It will hopefully encourage institutions and private parties having pink to red diamonds of known origin to scientifically investigate their collection in order to help understanding the pink diamond story. Conducting such studies on a world-record red diamond also demonstrates that such experiments are safe to be conducted on valuable stones. In the meantime, the team has enjoyed being able to work on such an astonishing stone, which is now on public display for everyone to enjoy.

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