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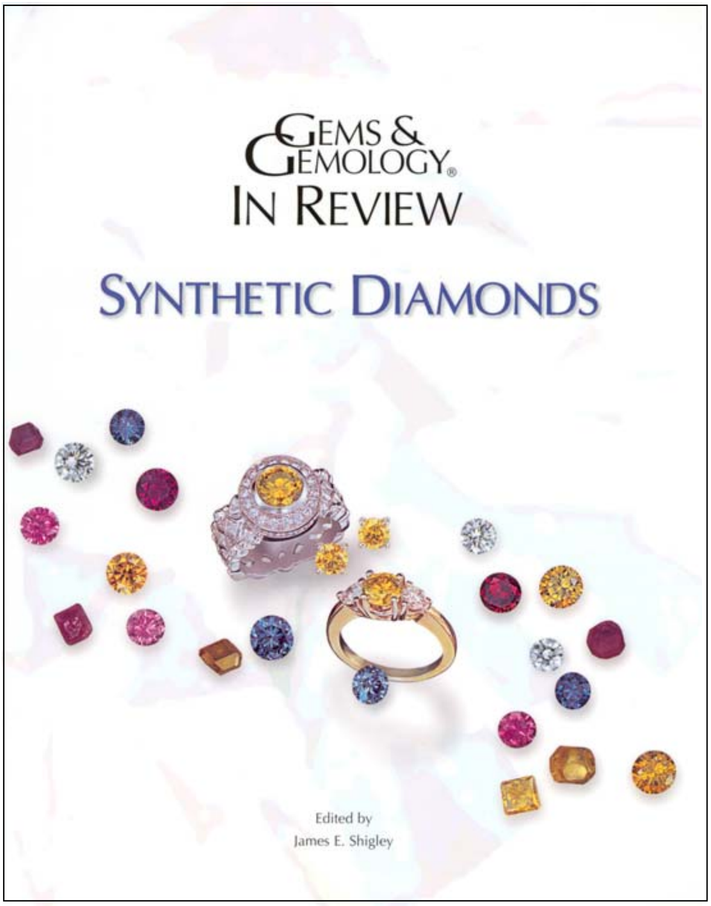
GEMS&GEMOLOGY IN REVIEW: SYNTHETIC DIAMONDS



GEMS&GEMOLOGY REVISADO: DIAMANTES SINTÉTICOS

294 páginas de formato
29 x 22 cm. de tamaño,
encuadernado con tapa
semirígida y cubreportadas duro,
con dos pósters de gran tamaño.
Editado por James E. Shigley

G&G IN REVIEW: SYNTHETIC DIAMONDS

Fundada en 1934, Gems & Gemology es la revista perteneciente al Instituto Gemológico Americano, GIA. G&G publica artículos rompedores con información técnica sobre diamantes, piedras de color, perlas – donde se encuentran, sus características únicas, tratamientos a los que se someten, técnicas de identificación – todo acompañado de fotografías y gráficos informativos.

Los volumenes de la colección Gems & Gemology In Review se centran en tres aspectos de los diamantes tan importantes como son los diamantes *fancy,* los sintéticos y los tratados. Se basan en la realización de artículos nuevos de alto interés, también incluyen reportajes publicados originalmente en la revista. La serie G&G in Review consta de tres volúmenes: Diamantes Sintéticos, Diamantes de Color y Diamantes Tratados. Todos los volúmenes están encuadernados con un alto nivel y con fotografías de una calidad inmejorable.

La colección Gems & Gemology In Review, está editado por la editorial James E. Shigley y por ahora sólo existe la versión en inglés.

El tomo de esta colección Diamantes Sintéticos, trata este tema con total profesionalidad y conocimiento científico, narrando su historia y evolución desde sus comienzos en General Electric hasta el procedimiento de crecimiento por deposición de carbono, pasando por los HPHT, Sumitomo, etc.

Explicado de forma sencilla, clara y extensa el libro contiene multitud de fotografías a todo color, gráficos, diagramas... Con encuadernación de lujo el libro tiene tapas semirígidas y una cobertura exterior fuerte para una mejor conservación. Son casi 300 páginas de alta calidad con un tamaño de 29x22 cm. acompañadas de dos cuadros sinópticos en forma de póster de gran tamaño que resultan una herramienta muy útil a la hora de reconocer una de estos ejemplares.

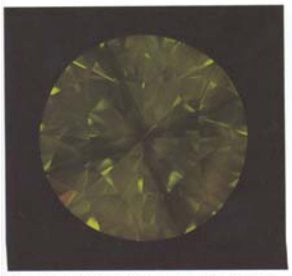


Figure 6. This 0.91 ct De Beers synthetic diamond (reference no. 30101) displays the zoned fluorescence to short-wave UV that is commonly seen in synthetic diamonds. The black, cross-shaped areas where there is no fluorescence correspond to internal growth sectors that lack the impurities responsible for the UV fluorescence emitted by the other growth sectors. Photo by Shane Elen.

reflected light (figure 11, right). These triangular inclusions often were apparent only in certain orientations of the sample (with respect to the direction of the light source); otherwise, they were nearly transparent and could easily go unnoticed during observation with a gemological microscope. Close inspection of these features revealed surface details similar to the large tetrahedral stacking faults observed using X-ray topography (as illustrated in Field, 1979, p. 442).

We did not see intersecting graining patterns in any of the samples; these patterns are an important identification feature in colored synthetic diamonds (Shigley et al., 1995b). Even the most strongly colored sample (no. 30095) exhibited no obvious internal color zoning. (In several instances, though, a very faint color zone was seen with magnification; table 1.)

Birefringence. When observed between crossed polarizing filters with the microscope, the synthetic diamonds typically displayed weak anomalous birefringence ("strain"; see, e.g., figure 6 in Shigley et al., 1993d, p. 194), as was the case for many of the colored synthetic diamonds we examined. This

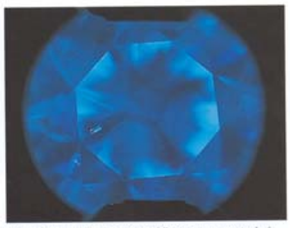
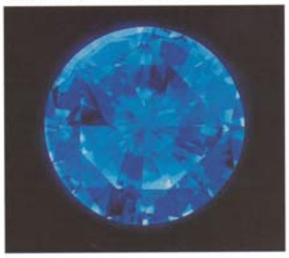


Figure 7. The uneven pattern of fluorescence typical of synthetic diamonds—here, in a cross shape—is readily apparent in this reference photo taken with the De Beers DiamondView verification instrument. Note that because two very different excitation sources are used, the color of fluorescence as seen with the DiamondView is very different from that seen with a standard UV unit (e.g., figure 6). Photo by Shane Elen.

weak "strain" is indicated by low-order interference colors (typically just black, gray, or white, and frequently in a cross-shaped pattern).

Figure 8. Like fluorescence, cathodoluminescence in near-colorless synthetic diamonds is also typically uneven and very different from the patterns seen in natural diamonds. A faint cross shape is visible in this 0.61 ct near-colorless De Beers synthetic diamond (reference no. 30100). Photo by Shane Elen.



NEAR-COLORLESS SYNTHETIC DIAMONDS (1997) 159

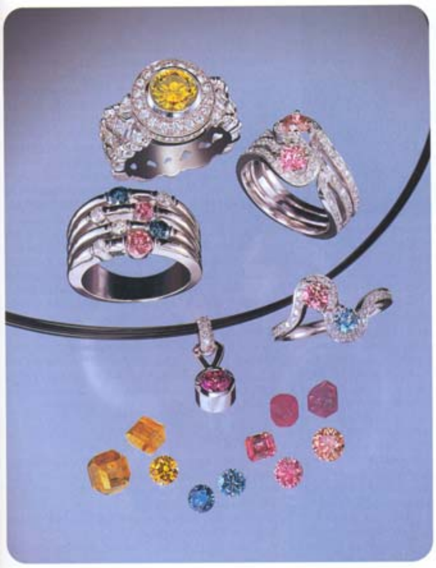


Figure 1. A new, undisclosed source is producing a broad range of synthetic diamonds for Chatham Created Gems of San Francisco. The loose faceted yellow, blue, and pink lab-grown diamonds shown here range from 0.28 to 0.51 ct. The jewelry set with pink and blue lab-grown diamonds is by Judith Conway. The ring set with a 1.19 ct yellow lab-grown diamond is by Doris Panos. Courtesy of Chatham Created Gems; photo by Harold & Erica Van Pelt.

more closely resemble natural diamonds than most of the synthetic diamonds we have encountered in the past, which have had very intense colors. Furthermore, a number of the examined samples are very low-nitrogen-containing synthetic diamonds that are nearly type IIa material; past reports on synthetic diamonds that are type IIa described material that was colorless or near colorless (for an explanation of diamond types, see Collins, 1982, 2001). The broad commercial availability of these new synthetic diamonds with lighter, more "natural-looking" colors reinforces the need for gemologists to understand how to identify them.

MATERIALS AND METHODS

We examined a total of 129 samples during this study, selected from a broad range provided by Chatham Created Gems. There were 20 crystals (0.44–1.74 ct) and 109 faceted samples (0.13–1.34 ct). In terms of their basic hues, there were 39 yellow (including one green-yellow and one yellow-brown), 29 blue, 16 green (including one greenish gray), and 45 pink samples (including one pinkish purple), some of which are illustrated in figure 2. (Note that all color terminology is according to the nomenclature used by the GIA Gem Laboratory to describe fancy-color diamonds.) Most of these are

CHATHAM LAB-GROWN DIAMONDS (2004) 189

TABLE 2. List of photoluminescence features recorded for the Chatham synthetic diamonds studied.

Wavelength (nm)	Band label	Cause[a]	Yellow: As-grown (12)	Yellow: Treated (2)	Blue: As-grown (12)	Blue: Treated (1)	Green: As-grown (6)	Green: Treated (5)	Pink: Treated (23)
527	2.351 eV	Nickel	——[b]	Mod	——	Wk	——	Wk	——
530		(Unknown)	——	St	Wk, Rare	Mod	Wk, Rare	Wk to St	——
535		Irradiation + heating	——	Wk	——	Wk	——	Wk	——
546	2.267 eV	Nickel	Wk[c], Common[d]	——	——	Wk	Wk, Rare	——	Wk, Rare
552		(Raman Band—Intrinsic to diamond)	(Common)	(Common)	(Common)	(Common)	(Common)	(Common)	(Common)
559		(Unknown)	Wk, Rare	——	Wk, Rare	Wk	Wk, Common	——	——
562		(Unknown)	——	——	——	Wk	——	——	——
575	NV[0]	Irradiation + heating	Wk to Mod, Common	Mod to St	Wk, Common	Mod	Wk to St, Common	Wk to St	St, Common
580		Nickel	Wk, Rare	St	Wk, Common	Wk	Wk, Rare	Wk	——
589		(Raman Band—Intrinsic to diamond)	(Common)	(Common)	(Common)	(Common)	(Common)	(Common)	(Not observed)
596		(Raman Band—Intrinsic to diamond)	(Common)	(Common)	(Common)	(Common)	(Common)	(Common)	(Not observed)
611		(Unknown)	Wk, Common	——	——	——	Wk, rare	——	——
623		Nickel	Wk, Rare	——	——	——	——	——	——
637	NV[-]	Nitrogen	Wk to St, Common	St	Wk, Rare	Mod	Wk to St, Common	St	St, Common
647		(Unknown)	——	——	——	St	——	Mod to St	——
657		Nickel	Wk, Common	——	——	——	——	Wk to Mod	——
693		Nickel	Mod to St, Rare	——	——	——	——	——	Mod, Rare
704		Nickel	Wk, Rare	——	——	——	——	——	——
711		Nickel	——	——	——	——	Wk, Rare	——	——
721		Nickel	——	——	——	——	——	Wk to St	——
727		Nickel	Wk to Mod, Rare	——	——	——	——	——	——
732		Nickel	——	Wk	——	——	——	——	——
741	GR1	Irradiation	——	St	——	St	——	Mod to St	——
744	GR1	Irradiation	——	Wk	——	St	——	Wk to Mod	——
800		(Unknown)	Wk, Rare	——	——	——	——	——	——
808		(Unknown)	Wk, Rare	——	——	——	Wk, Rare	Wk	——
883 +884	1.40 eV	Nickel	——	——	Wk, Rare	——	Wk to Mod, Rare	——	Wk, Rare

[a] Reference: Zaitsev (2001).
[b] —— = not present.
[c] Intensity: Wk = weak, Mod = moderate, and St = strong, based on a subjective judgment of peak height.
[d] Abundance: Rare = present in less than one-third of samples investigated, Common = present in more than one-third of samples investigated, and Not observed = not observed due to laser-induced fluorescence of the sample.

Figure 3. Among the "yellow" synthetic diamonds examined during this study are those that would be described as orange-yellow, orangy yellow, and yellow (on the left, from left to right: 0.35-0.62 ct); brownish orangy yellow and orangy yellow (center: 0.28 and 0.21 ct); and yellow-brown (right: 0.22 ct). Photos by Maha Tannous.

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