Letters

MORE ON THE "FLUORESCENCE CAGE"

We read with interest the article "'Fluorescence cage': Visual identification of HPHT-treated type I diamonds," by Inga Dobrinets and Alexander Zaitsev in the Fall 2009 issue (pp. 186–190). The authors claim that the fluorescence cage they observed is proof of high-pressure, high-temperature (HPHT) treatment of type I diamonds.

The features described are identical to those published over eight years ago by Pierre Yves Boillat and coauthors ("Luminescences sous excitation visible des diamants noirs irradiés: les luminescences d'arêtes" [Luminescence of irradiated black diamonds under visible light excitation: Facet edge luminescence], *Revue de Gemmologie afg*, No. 141–142, 2001, pp. 37–41; see also figure 1). This article has an English abstract and figure captions, as it was felt the results could interest the international gemological community. "Facet-edge luminescence" is illustrated in 17 photographs.

Hence, fluorescence cage luminescence is not characteristic of HPHT-treated diamonds. It is common among certain classes of irradiated (and sometimes annealed) diamonds. A similar phenomenon can be observed as well on natural, untreated diamonds, although there are minor differences. Ascertaining unambiguously the cause of this curious phenomenon requires further experimentation.

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REPLY: The reason we concluded that the "fluorescence cage" is related only to HPHT-treated type I diamonds was a simple one: We never saw this effect in diamonds except in HPHT-treated ones, and at the time of our *G&G* publication, we were unaware of the Boillat et al. article (for which we offer our apology). We did not observe the effect on irradiated diamonds that were occasionally checked together with HPHT-treated ones with the fluorescence microscope. Although one heavily electron-irradiated diamond of deep greenish blue color did show a weak "cage," this observation was not anomalous because that diamond also revealed clear features of prior HPHT treatment. We interpreted this fact as evidence of the high stability of the "cage"—that is, that it can survive heavy irradiation. Thus, from a practical point of view, we have no doubt that the "fluorescence cage" is a very strong indicator of HPHT treatment.

Concerning the occurrence of the "cage" effect in natural (untreated) diamonds, of course, it is theoretically possible. Indeed, some natural-color diamonds may reveal characteristic features of HPHT annealing or irradiation that has occurred while the gem is in the earth. In our experience, however, such diamonds are extremely rare.

Concerning the physics of the effect, we are not certain that the "fluorescence cage" seen in HPHT-treated diamonds is fully identical to the "facet-edge luminescence" observed in the irradiated stones. In some HPHT-treated diamonds we examined, the "fluorescence cage" has an appearance very different from that of the regular "cage" and that of the "facet-edge luminescence." These results will be published soon elsewhere.

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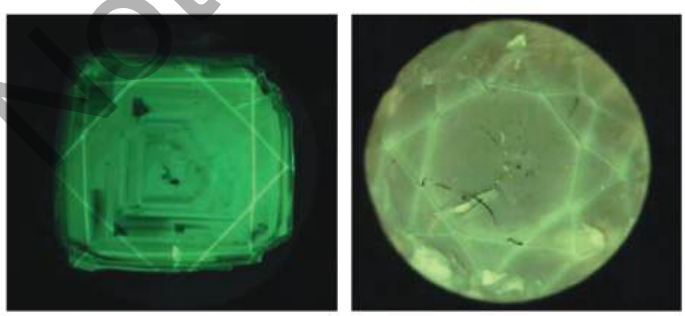

Figure 1. These photos show facet-edge luminescence in irradiated diamonds that were not HPHT treated. Left = irradiated dark green, nearly black diamond (2.5 mm); right = irradiated and heated (830°C) black diamond, magnified 30×. The same luminescence pattern was observed before heating. Photomicrographs by F. Notari.