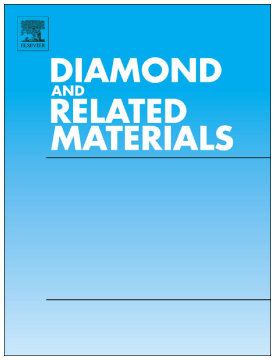


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# Optical defects in milky type IaB diamonds

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## Abstract

The optical features of milky type IaB diamonds were studied systematically by non-destructive approaches including FTIR, photoluminescence (PL), and cathodoluminescence (CL) spectroscopy. From 97 type IaB diamonds ranging from 0.2 ct to ~100 ct submitted to GIA's New York laboratory for screening, we found that all the milky type IaB diamonds consistently displayed the $VN_3H$ defect with an absorption line at 3107 $cm^{-1}$, and ~96% of them were accompanied by a weaker line at 3085.4 $cm^{-1}$, which is undetectable in most non-milky diamonds. Most of the diamond samples display no platelet defect or a very tiny residual platelet peak with a position at larger wavenumber in milky diamonds than in non-milky counterparts. "Amber center" with a weak but sharp absorption line at 4168.8 $cm^{-1}$ has been observed in ~73% of the milky diamonds and ~24% of the non-milky ones. Photoluminescence (PL) results reveal that several defects with ZPLs at 490.7, 536, 575.9 and 612.4 nm are more common in milky type IaB diamonds than non-milky ones. A zero-phonon line (ZPL) at 536 nm has been confirmed by PL mapping and CL spectra as a product of plastic deformation, and it might be linked with the $H_4$ center ($N_4V_2$ defect). A ZPL at 490.7 nm could be related to a nitrogen-vacancy complex. The defects present more often in milky IaB diamonds are generally associated with plastic deformation. The presence of a hydrogen-related peak at 3085.4 $cm^{-1}$ and a 536 nm center would help effectively distinguish ~~the milky type~~ IaB diamonds with subtle milky areas from their non-milky counterparts.