
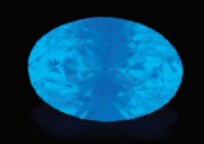


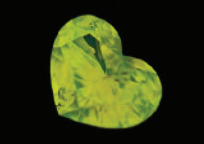
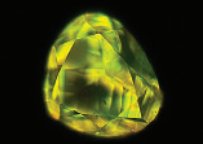

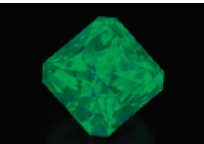
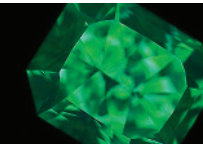


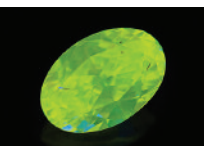


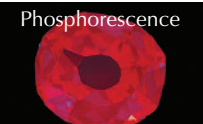





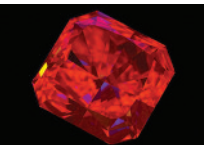









TABLE 1. Important optical defects in diamond and their effect on color and luminescence.

Color	Optical defect and spectroscopic means of detection	LWUV fluorescence (~365 nm lamp)	DiamondView luminescence (<220 nm source)	Color	Optical defect and spectroscopic means of detection	LWUV fluorescence (~365 nm lamp)	DiamondView luminescence (<220 nm source)
No effect	ND1: A defect with an absorption line at 393.6 nm (3.150 eV). Thought to consist of a vacancy in the negative charge state (V ⁻). Produced by natural or artificial irradiation. <i>UV</i>	No effect	No effect	May contribute to a green color	H2: An impurity and intrinsic defect with an absorption line at 986.3 nm (1.256 eV, 10125 cm ⁻¹) and associated bands. Thought to consist of two substitutional nitrogen atoms separated by a vacancy in a negative charge state (N-V-N) ⁻ . Occurs naturally or can be produced by irradiation followed by annealing or by high-pressure, high-temperature annealing. <i>IR, PL</i>	No effect	No effect
	N3: An impurity and intrinsic defect with an absorption line at 415.2 nm (2.985 eV) and associated bands. Thought to consist of three substitutional nitrogen atoms surrounding a vacancy (3N+V). Often occurs with the associated N2 (477.2 nm) and several other related bands (465, 452, 435, and 423 nm) in "Cape" diamond spectra. All are naturally occurring. <i>UV, PL, EPR</i>			No effect	H1c: An impurity and intrinsic defect of uncertain structure with an infrared absorption line at 1934 nm (0.6408 eV, 5171 cm ⁻¹). Thought to be associated with nitrogen B centers. Occurs naturally or can be produced by irradiation followed by annealing. <i>IR</i>	No effect	No effect
	480 band: A naturally occurring optical defect of uncertain structure (sometimes attributed to substitutional oxygen) in type I diamonds with a broad absorption band centered at 480 nm (2.580 eV). <i>UV</i>			No effect	H1b: An impurity and intrinsic defect of uncertain structure with an infrared absorption line at 2024 nm (0.612 eV, 4941 cm ⁻¹). Thought to be associated with nitrogen A centers. Occurs naturally or can be produced by irradiation followed by annealing. <i>IR</i>	No effect	No effect
	H4: An impurity and intrinsic defect with an absorption line at 496.2 nm (2.498 eV). Thought to consist of four substitutional nitrogen atoms surrounding two vacancies (4N+2V). Occurs naturally or can be produced by irradiation followed by annealing. <i>UV, PL</i>				Hydrogen: Defect(s) of uncertain structure with many related infrared absorption lines, most notably at 3107 cm⁻¹ (0.385 eV). Occurs naturally. This defect can also produce yellow and violet colors. <i>IR, UV</i>	No effect	No effect
	H3: An impurity and intrinsic defect with an absorption line at 503.2 nm (2.463 eV) and associated bands. Thought to consist of two substitutional nitrogen atoms separated by a vacancy in a neutral charge state (N-V-N) ⁰ . Occurs naturally or can be produced by irradiation followed by annealing or by high-pressure, high-temperature annealing. <i>UV, PL</i>				Boron: A defect with a primary infrared absorption line at 2803 cm⁻¹ (0.348 eV) and associated lines, and a band extending into the visible region. Thought to consist of single substitutional boron atoms. Occurs naturally. This defect produces red phosphorescence. <i>IR</i>	Phosphorescence 	Phosphorescence 
May contribute to a green color	3H: A defect with an absorption line at 503.4 nm (2.462 eV). Thought to be related to interstitial carbon (I). Produced by natural or artificial irradiation. <i>UV, PL</i>	No effect	No effect		A center: A defect with an infrared absorption band at 1282 cm⁻¹ (0.159 eV). Thought to consist of two adjacent substitutional nitrogen atoms (N-N). Occurs naturally. <i>IR</i>	Quenches luminescence	Quenches luminescence
	550 band: An optical center of uncertain structure with a broad absorption band centered at 550 nm (2.250 eV). Thought to result from plastic deformation of the lattice structure. Occurs naturally. <i>UV</i>	No effect	No effect		B center: A defect with an infrared absorption band at 1175 cm⁻¹ (0.146 eV). Thought to consist of four adjacent substitutional nitrogen atoms surrounding a vacancy (4N+V). Occurs naturally. <i>IR</i>	No effect	No effect
	NV⁰: An impurity and intrinsic defect with an absorption line at 575 nm (2.156 eV) and associated bands. Thought to consist of a single substitutional nitrogen atom associated with a vacancy in a neutral charge state (NV ⁰). Occurs naturally or can be produced by irradiation followed by annealing. <i>PL, EPR, UV</i>				C center: A defect with an infrared absorption band at 1130 cm⁻¹ (0.140 eV). Thought to consist of a single substitutional nitrogen atom (N). Occurs naturally or can be produced by high-pressure, high-temperature annealing of diamonds containing A or B centers. <i>IR, UV, EPR</i>	No effect	No effect
May contribute to other colors	595 band: An optical defect of uncertain structure with an absorption band at 594.4 nm (2.086 eV). Thought to be related to nitrogen. Occurs naturally or can be produced by irradiation followed by annealing. <i>UV</i>	No effect	No effect	No effect	H1a: An impurity and intrinsic defect of uncertain structure with an infrared absorption line at 1450 cm⁻¹ (0.180 eV). Thought to be associated with interstitial nitrogen. Occurs naturally or can be produced by irradiation followed by annealing. <i>IR</i>	No effect	No effect
	NV⁻: An impurity and intrinsic defect with an absorption line at 637 nm (1.945 eV) and associated bands. Thought to consist of a single substitutional nitrogen atom associated with a vacancy in a negative charge state (NV ⁻). Occurs naturally or can be produced by irradiation followed by annealing or by high-pressure, high-temperature annealing. <i>PL, EPR, UV</i>			No effect	Platelet: An impurity and intrinsic defect of uncertain structure with an infrared absorption line at about 1360 cm⁻¹ (0.169 eV). Thought to be associated with groups of interstitial carbon atoms. Occurs naturally. <i>IR</i>	No effect	No effect
	GR1: A defect with a pair of absorption lines at 740.9 nm (1.673 eV) and at 744.4 nm (1.665 eV) and associated bands. Thought to consist of a vacancy in a neutral charge state (V ⁰). Produced by natural or artificial irradiation. <i>UV, PL</i>	No effect	No effect		Vacancy cluster: A defect of uncertain structure with increasing absorption toward the blue end of the spectrum. Thought to consist of groups of vacancies. Occurs naturally. <i>UV</i>	No effect	No effect

UV = Ultraviolet-visible absorption spectroscopy
IR = Infrared absorption spectroscopy

PL = Photoluminescence spectroscopy
EPR = Electron paramagnetic resonance spectroscopy