Contents

1	Intr	oduction	I				
2	Diar	monds Used for HPHT Treatment	5				
	2.1	Types of Diamond	. 5				
		2.1.1 Type I Diamonds	6				
		2.1.2 Type II Diamonds	8				
		2.1.3 Natural Occurrence of Diamond Types	9				
		2.1.4 Recognition of Diamond Types	10				
	2.2	Colors of Natural Diamonds	12				
		2.2.1 Brown	13				
		2.2.2 Yellow	16				
		2.2.3 Blue to Violet	18				
		2.2.4 Green	19				
		2.2.5 Pink and Red	21				
		2.2.6 Gray	23				
	2.3	Color of Diamonds Used for HPHT Treatment	24				
3	Para	Parameters of HPHT Treatment					
	3.1	Temperature	28				
	3.2	Pressure	30				
	3.3	Time	32				
	3.4	Comparing HPHT Treatment and Natural HPHT Annealing	35				
4	НРЕ	HT-Induced Transformations	39				
	4.1	Nitrogen Aggregation	39				
	4.2	Dissociation of Nitrogen Complexes	46				
	4.3	Ultimate HPHT Treatment	52				
	4.4	Multi-Process Treatment	53				
	4.5	Color Transformations	54				
		4.5.1 Removal of Brown Color and Decoloration	56				
		4.5.2 Fancy Colors	63				
	4.6	Typical Defect Transformations During Commercial					
		HPHT Treatment	82				

xii Contents

		4.6.1 Initially Brown Type IIa Diamonds	82					
		4.6.2 Initially Colorless Type IaAB Diamonds	83					
		4.6.3 Initially Brown Type Ia Diamonds	84					
		4.6.4 Initially Brown Low-Nitrogen Type IaB Diamonds	85					
5	Structural Features of HPHT-Treated Diamonds							
	5.1	Fractures and Cracks	87					
	5.2	Inclusions	89					
	5.3	Graining	92					
	5.4	Surface Modification	93					
	5.5	Internal Stress	94					
	5.6	Dislocations	96					
6	Spectroscopic Features of HPHT-Treated Diamonds							
	6.1	Optical Centers in UV-Vis-NIR Spectral Range	100					
	6.2	Optical Centers in IR Spectral Range	169					
	6.3	Optical Continua	191					
		6.3.1 The Secondary Absorption	191					
		6.3.2 The Brown Absorption Continuum	192					
		6.3.3 The C Defect Absorption Continuum	194					
		6.3.4 The Boron Absorption Continuum	195					
	6.4	Combinations of Optical Centers and Continua	197					
7	Visu	Visual Luminescence and Luminescence Imaging						
	7.1	Blue Fluorescence	203					
	7.2	Green/Yellow Fluorescence	204					
	7.3	Orange/Red Fluorescence	206					
	7.4	Fluorescence Cage	208					
	7.5	Fluorescence of Macrodefects	211					
8	Tec	hnology and Business of HPHT Treatment	215					
	8.1	Basics of HPHT Treatment Technology	215					
	8.2	Selection and Preparation of Diamonds for HPHT Treatment	217					
		8.2.1 Selection and Pre-Shaping	218					
		8.2.2 Cleaning of Pre-Shaped Diamonds	218					
		8.2.3 Characterization of Pre-Shaped Diamonds	220					
	8.3	HPHT Annealing	220					
	8.4	Commercial Aspects of HPHT Treatment	226					
		8.4.1 Price of HPHT-Treated Diamond	226					
		8.4.2 Market of HPHT-Treated Diamonds	228					
9	Con	Concluding Remarks						
	9.1	Commercial Danger of HPHT Treatment	231					
	9.2	Fidelity of Identification of HPHT-Treated Diamond	234					

xiii

	9.2.2	Identification Features	237
9.3	9.2.4	Identification Techniques	239
Referen	ices		241
Index .			255