

CHAPTER ONE: INTRODUCTION.....	1
STUDY GOAL AND OBJECTIVES	1
REASONS FOR DOING THE STUDY	1
INTENDED AUDIENCE.....	1
SCOPE OF REPORT	2
METHODOLOGY	2
INFORMATION SOURCES.....	2
AUTHOR’S CREDENTIALS	2
BCC ONLINE SERVICES.....	3
DISCLAIMER	3
 CHAPTER TWO SUMMARY.....	 4
SUMMARY.....	4
<i>SUMMARY TABLE GLOBAL FORECAST OF FLAME-RETARDANT</i>	
<i>CHEMICALS CONSUMPTION, THROUGH 2014 (MILLIONS).....</i>	<i>5</i>
<i>SUMMARY FIGURE GLOBAL FORECAST OF FLAME-RETARDANT</i>	
<i>CHEMICALS CONSUMPTION, 2008-2014 (MILLIONS).....</i>	<i>5</i>
SUMMARY (CONTINUED)	6
 CHAPTER THREE: INDUSTRY OVERVIEW.....	 7
IMPORTANCE OF THE INDUSTRY	7
HISTORY OF THE FLAME-RETARDANT CHEMICALS INDUSTRY	8
FLAME RETARDANCY BASICS	8
TERMINOLOGY	8
MECHANISMS OF BURNING	9
<i>TABLE 1 ADDITIVES/MODIFIERS FOR CONTROLLING BURNING</i>	<i>9</i>
FLAME RETARDANCY CONCEPTS.....	10
PHYSICAL DILUTION	10
CHEMICAL INTERFERENCE	10
INERT GAS DILUTION	11
THERMAL QUENCHING	11
PROTECTIVE COATINGS.....	11
<i>TABLE 2 FLAME-RETARDANT CHEMICALS AND THEIR</i>	
<i>MECHANISMS.....</i>	<i>12</i>
TYPES OF FLAME RETARDANTS	12
ADDITIVE FLAME RETARDANTS	12
REACTIVE FLAME RETARDANTS	13
SYNERGISTIC FLAME RETARDANTS	13
<i>TABLE 3 TYPICAL SYNERGISTIC FLAME RETARDANT</i>	
<i>COMBINATIONS (PERCENT).....</i>	<i>14</i>
FLAME-RETARDANT CHEMICALS.....	
<i>TABLE 4 COMBINED CLASSIFICATION SYSTEMS FOR FLAME</i>	
<i>RETARDANT CHEMICALS</i>	<i>14</i>
FLAME-RETARDANT CHEMICAL PRODUCTS	15

<i>TABLE 5 FLAME-RETARDANT CHEMICALS AND THE MARKETS IN WHICH THEY ARE USED</i>	15
<i>TABLE 6 GLOBAL FORECAST OF CONSUMPTION AND SALES OF FLAME-RETARDANT CHEMICALS, THROUGH 2014 (MILLIONS)</i>	15
<i>TABLE 6 (CONTINUED)</i>	16
ALUMINA TRIHYDRATE.....	16
ANTIMONY OXIDE.....	16
BROMINE-BASED	17
CHLORINE-BASED	18
MAGNESIUM HYDROXIDE.....	18
MELAMINE	19
PHOSPHORUS-BASED	19
OTHER FLAME-RETARDANT CHEMICALS.....	20
FLAME-RETARDANT CHEMICAL END-USE MARKETS	21
<i>TABLE 7 MARKETS USING FLAME-RETARDANT CHEMICALS</i>	21
PLASTICS	22
TEXTILES	22
WOOD AND PAPER	22
COATINGS USED FOR PAINTS.....	22
COATINGS USED FOR CONSTRUCTION	22
COATINGS USED FOR DECORATIONS	23
THE FUTURE OF THE FLAME-RETARDANT CHEMICALS	
INDUSTRY	23
THE FUTURE OF THE ... (CONTINUED).....	24
GOVERNMENT REGULATION.....	25
REACH	25
WEE.....	26
ROHS	26
UNDERWRITERS LABORATORIES	26
U.S. AGENCIES CONCERNED WITH THE USE OF FLAME	
RETARDANTS.....	27
Consumer Products Safety Commission.....	27
National Fire Protection Association.....	28
<i>TABLE 8 NFPA GUIDELINES AND STANDARDS</i>	29
National Institute of Standards and Technology	29
Uniform Building Code.....	30
U.S. Federal Aviation Regulations	30
Upholstery Regulations	30
INTERNATIONAL REGULATIONS REQUIRING THE USE	
OF FLAME RETARDANTS	31
Europe	31
European Committee for Standardization.....	31
ISO TC61 Committee Standards	32

The Department for Business, Enterprise and Regulatory Reform (BERR).....	32
The British Standards Institution (BSI).....	32
Asia.....	33
UNITED STATES REGULATIONS RESTRICTING THE USE OF CERTAIN FLAME RETARDANTS	34
Toxic Substances Control Act.....	34
EPA Regulations.....	34
State Laws	35
EUROPEAN REGULATIONS RESTRICTING THE USE OF CERTAIN FLAME RETARDANTS	35
WEEE.....	35
RoHS	36
TESTING.....	36
TESTING GOALS	37
TYPES OF TESTING.....	37
Small-Scale Testing.....	37
<i>TABLE 9 OXYGEN INDICES OF SOME COMMON MATERIALS</i>	38
Cone Calorimeter.....	38
<i>TABLE 10 CONE CALORIMETRY PARAMETERS AND VALUES</i>	39
Medium-Scale Testing.....	39
Large-Scale Testing.....	39
UL-94	40
<i>TABLE 11 UL-94 BURN TEST RATINGS</i>	40
Additional Tests.....	40
Additional Tests (Continued)	41
CHAPTER FOUR: MARKETS BY PRODUCT TYPE.....	42
<i>TABLE 12 FLAME-RETARDANT CHEMICALS</i>	42
<i>TABLE 13 GLOBAL FORECAST OF CONSUMPTION OF FLAME- RETARDANT CHEMICALS, THROUGH 2014 (MILLION POUNDS)</i>	43
<i>FIGURE 1 GLOBAL SHARE OF THE PRODUCT MARKET FOR FLAME-RETARDANT CHEMICALS BY VOLUME, 2008 (%)</i>	43
<i>FIGURE 1 (CONTINUED)</i>	44
<i>TABLE 14 GLOBAL FORECAST OF THE FLAME-RETARDANT CHEMICALS MARKET, THROUGH 2014 (\$ MILLIONS)</i>	44
<i>FIGURE 2 GLOBAL SHARE OF THE FLAME-RETARDANT CHEMICALS MARKET BY SALES, 2008 (%)</i>	45
THE WORLDWIDE FLAME-RETARDANT CHEMICALS MARKET	45
THE WORLDWIDE FLAME-RETARDANT ... (CONTINUED)	46
<i>TABLE 15 ESTIMATED WORLDWIDE CONSUMPTION OF FLAME- RETARDANT CHEMICALS BY REGION, THROUGH 2014 (MILLION POUNDS)</i>	47
<i>FIGURE 3 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, 2008 (%)</i>	47

<i>TABLE 16 ESTIMATED WORLDWIDE CONSUMPTION OF FLAME-RETARDANT CHEMICALS BY REGION, THROUGH 2014 (\$ MILLIONS)</i>	48
<i>FIGURE 4 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, 2008–2014 (\$ MILLIONS)</i>	48
ALUMINA TRIHYDRATE FLAME-RETARDANT CHEMICALS	49
ALUMINA TRIHYDRATE SOURCES.....	49
ALUMINA TRIHYDRATE GRADES	49
WORLDWIDE ALUMINA TRIHYDRATE MARKET	50
<i>TABLE 17 GLOBAL FORECAST OF ALUMINA TRIHYDRATE FLAME-RETARDANT CHEMICALS CONSUMPTION BY END USE, THROUGH 2014 (MILLION POUNDS)</i>	50
<i>FIGURE 5 GLOBAL SHARE OF ALUMINA TRIHYDRATE FLAME-RETARDANT CHEMICALS CONSUMPTION BY END USE, 2008 (%)</i>	51
<i>TABLE 18 GLOBAL FORECAST OF ALUMINA TRIHYDRATE FLAME-RETARDANT CHEMICALS MARKET BY END USE, THROUGH 2014 (\$ MILLIONS)</i>	52
<i>FIGURE 6 ESTIMATED WORLDWIDE MARKET SIZE AND GROWTH BY END USE OF ALUMINA TRIHYDRATE FLAME-RETARDANT CHEMICALS, 2008–2014 (\$ MILLIONS)</i>	52
<i>TABLE 19 GLOBAL FORECAST OF ALUMINA TRIHYDRATE FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, THROUGH 2014 (MILLION POUNDS)</i>	53
<i>FIGURE 7 GLOBAL FORECAST OF ALUMINA TRIHYDRATE FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, 2008–2014 (MILLION POUNDS)</i>	54
ANTIMONY OXIDE FLAME-RETARDANT CHEMICALS.....	54
ANTIMONY OXIDE SOURCES.....	55
ANTIMONY OXIDE PROPERTIES.....	55
<i>TABLE 20 COMPARISON OF THE PHYSICAL PROPERTIES OF COLLOIDAL ANTIMONY PENTOXIDE VS. ANTIMONY TRIOXIDE</i>	55
<i>TABLE 21 ADVANTAGES OF COLLOIDAL ANTIMONY PENTOXIDE OVER ANTIMONY TRIOXIDE</i>	56
WORLDWIDE ANTIMONY OXIDE MARKET	56
<i>TABLE 22 GLOBAL FORECAST OF ANTIMONY OXIDE FLAME-RETARDANT CHEMICALS CONSUMPTION BY END USE, THROUGH 2014 (MILLION POUNDS)</i>	57
<i>FIGURE 8 GLOBAL SHARE OF ANTIMONY OXIDE FLAME-RETARDANT CHEMICALS CONSUMPTION BY END USE, 2008 (%)</i>	57
<i>FIGURE 8 (CONTINUED)</i>	58
<i>TABLE 23 GLOBAL FORECAST OF THE ANTIMONY OXIDE FLAME-RETARDANT CHEMICALS MARKET SIZE AND GROWTH BY END USE, THROUGH 2014 (\$ MILLIONS)</i>	58

<i>FIGURE 9 GLOBAL FORECAST OF THE ANTIMONY OXIDE FLAME-RETARDANT CHEMICALS MARKET SIZE AND GROWTH BY END USE, 2008–2014 (\$ MILLIONS)</i>	59
<i>TABLE 24 GLOBAL FORECAST OF ANTIMONY OXIDE FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, THROUGH 2014 (MILLION POUNDS)</i>	60
<i>FIGURE 10 GLOBAL FORECAST OF ANTIMONY OXIDE FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, 2008–2014 (MILLION POUNDS)</i>	60
<i>BROMINE-BASED FLAME-RETARDANT CHEMICALS</i>	61
<i>TABLE 25 GLOBAL SHARE OF BROMINE-BASED FLAME RETARDANTS IN ELECTRICAL/ELECTRONICS COMPONENTS, 2008 (%)</i>	61
<i>TABLE 26 CLASSES OF AROMATIC BROMINE FLAME-RETARDANT CHEMICALS</i>	62
<i>TABLE 27 IMPORTANT AROMATIC BROMINE FLAME-RETARDANT CHEMICALS</i>	63
<i>TABLE 28 IMPORTANT TYPES OF ALIPHATIC BROMINE COMPOUNDS</i>	64
<i>BROMINE PROPERTIES</i>	64
<i>BROMINE SOURCES</i>	64
<i>BROMINE GRADES</i>	64
<i>BROMINE MARKET SIZE</i>	65
<i>TABLE 29 GLOBAL FORECAST OF BROMINE-BASED FLAME-RETARDANT CHEMICALS CONSUMPTION BY END USE, THROUGH 2014 (MILLION POUNDS)</i>	65
<i>FIGURE 11 GLOBAL FORECAST OF BROMINE-BASED FLAME-RETARDANT CHEMICALS CONSUMPTION BY END USE, 2008 (%)</i>	66
<i>TABLE 30 GLOBAL FORECAST OF THE BROMINE-BASED FLAME-RETARDANT CHEMICALS MARKET BY END USE, THROUGH 2014 (\$ MILLIONS)</i>	67
<i>FIGURE 12 GLOBAL FORECAST OF THE BROMINE-BASED FLAME-RETARDANT CHEMICALS MARKET BY END USE, 2008–2014 (\$ MILLIONS)</i>	67
<i>TABLE 31 GLOBAL FORECAST OF BROMINE-BASED FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, THROUGH 2014 (MILLION POUNDS)</i>	68
<i>FIGURE 13 GLOBAL FORECAST OF BROMINE-BASED FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, 2008–2014 (MILLION POUNDS)</i>	69
<i>TABLE 32 GLOBAL FORECAST OF DECA-BROMODIPHENYL ETHER (DECA-BDE) CONSUMPTION BY REGION, THROUGH 2014 (MILLION POUNDS)</i>	69

<i>FIGURE 14 GLOBAL FORECAST OF DECABROMODIPHENYL ETHER (DECA-BDE) CONSUMPTION BY REGION, 2008–2014 (MILLION POUNDS)</i>	70
CHLORINE-BASED FLAME-RETARDANT CHEMICALS.....	70
CHLORINE PROPERTIES	71
CHLORINE SOURCES.....	72
CHLORINE GRADES	72
Chlorinated Alicyclic Acid	72
Chlorinated Paraffins.....	72
Dechlorane Plus.....	72
CHLORINE MARKET SIZE.....	73
<i>TABLE 33 GLOBAL FORECAST OF CHLORINE-BASED FLAME-RETARDANT CHEMICALS CONSUMPTION BY END USE, THROUGH 2014 (MILLION POUNDS)</i>	74
<i>FIGURE 15 GLOBAL SHARE OF CHLORINE-BASED FLAME-RETARDANT CHEMICALS CONSUMPTION BY END USE, 2008 (MILLION POUNDS)</i>	74
<i>FIGURE 15 (CONTINUED)</i>	75
<i>TABLE 34 GLOBAL FORECAST OF THE CHLORINE-BASED FLAME-RETARDANT CHEMICALS MARKET BY END USE, THROUGH 2014 (\$ MILLIONS)</i>	75
<i>FIGURE 16 ESTIMATED WORLDWIDE MARKET SIZE AND GROWTH BY END USE OF CHLORINE-BASED FLAME-RETARDANT CHEMICALS, 2008–2014 (\$ MILLIONS)</i>	76
<i>TABLE 35 GLOBAL FORECAST OF CHLORINE-BASED FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, THROUGH 2014 (MILLION POUNDS)</i>	77
<i>FIGURE 17 GLOBAL FORECAST OF CHLORINE-BASED FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, 2008–2014 (MILLION POUNDS)</i>	77
MAGNESIUM HYDROXIDE FLAME-RETARDANT CHEMICALS.....	78
MAGNESIUM HYDROXIDE PROPERTIES.....	78
MAGNESIUM HYDROXIDE SOURCES.....	78
MAGNESIUM HYDROXIDE GRADES	79
MAGNESIUM HYDROXIDE MARKET SIZE.....	79
<i>TABLE 36 GLOBAL FORECAST OF MAGNESIUM HYDROXIDE FLAME-RETARDANT CHEMICALS CONSUMPTION BY END USE, THROUGH 2014 (MILLION POUNDS)</i>	79
<i>FIGURE 18 GLOBAL SHARE OF MAGNESIUM HYDROXIDE FLAME-RETARDANT CHEMICALS CONSUMPTION BY END USE, 2008 (%)</i>	80
<i>TABLE 37 GLOBAL FORECAST OF THE MAGNESIUM HYDROXIDE FLAME-RETARDANT CHEMICALS MARKET BY END USE, THROUGH 2014 (\$ MILLIONS)</i>	81

<i>FIGURE 19 GLOBAL FORECAST OF THE MAGNESIUM HYDROXIDE FLAME-RETARDANT CHEMICALS MARKET BY END USE, 2008–2014 (\$ MILLIONS)</i>	81
<i>TABLE 38 GLOBAL FORECAST OF MAGNESIUM HYDROXIDE FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, THROUGH 2014 (MILLION POUNDS)</i>	82
<i>FIGURE 20 GLOBAL SHARE OF MAGNESIUM HYDROXIDE FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, 2008–2014 (MILLION POUNDS)</i>	82
MELAMINE-BASED FLAME-RETARDANT CHEMICALS.....	83
MELAMINE PROPERTIES	83
MELAMINE SOURCES.....	84
MELAMINE GRADES	84
Pure Melamine	84
Melamine Derivatives	85
Melamine Homologues	85
<i>TABLE 39 COMMON NITROGEN-BASED FLAME-RETARDANT CHEMICALS</i>	86
MELAMINE MARKET SIZE.....	86
<i>TABLE 40 GLOBAL FORECAST OF MELAMINE FLAME-RETARDANT CHEMICALS CONSUMPTION BY END USE, THROUGH 2014 (MILLION POUNDS)</i>	86
<i>FIGURE 21 GLOBAL SHARE OF MELAMINE FLAME-RETARDANT CHEMICALS CONSUMPTION BY END USE, 2008 (%)</i>	87
<i>TABLE 41 GLOBAL FORECAST OF THE MELAMINE FLAME-RETARDANT CHEMICALS MARKET BY END USE, THROUGH 2014 (\$ MILLIONS)</i>	88
<i>FIGURE 22 GLOBAL FORECAST OF THE MELAMINE FLAME-RETARDANT CHEMICALS MARKET BY END USE, 2008–2014 (\$ MILLIONS)</i>	88
<i>TABLE 42 GLOBAL FORECAST OF MELAMINE FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, THROUGH 2014 (MILLION POUNDS)</i>	89
<i>FIGURE 23 GLOBAL FORECAST OF MELAMINE FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, 2008–2014 (MILLION POUNDS)</i>	89
PHOSPHORUS-BASED FLAME-RETARDANT CHEMICALS.....	90
PHOSPHATE ESTERS.....	90
PHOSPHONATES AND PHOSPHINATES	91
RED PHOSPHORUS	91
AMMONIUM POLYPHOSPHATE.....	91
PHOSPHORUS PROPERTIES	92
PHOSPHORUS MARKET SIZE.....	92

<i>TABLE 43 GLOBAL FORECAST OF PHOSPHORUS-BASED FLAME-RETARDANT CHEMICALS CONSUMPTION BY END-USE, THROUGH 2014 (MILLION POUNDS)</i>	92
<i>FIGURE 24 GLOBAL SHARE OF PHOSPHORUS-BASED FLAME-RETARDANT CHEMICALS CONSUMPTION BY END USE, 2008 (%)</i>	93
<i>TABLE 44 GLOBAL FORECAST OF THE PHOSPHORUS-BASED FLAME-RETARDANT CHEMICALS MARKET BY END USE, THROUGH 2014 (\$ MILLIONS)</i>	94
<i>FIGURE 25 GLOBAL FORECAST OF THE PHOSPHORUS-BASED FLAME-RETARDANT CHEMICALS MARKET BY END USE, 2008–2014 (\$ MILLIONS)</i>	94
<i>TABLE 45 GLOBAL FORECAST OF PHOSPHORUS-BASED FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, THROUGH 2014 (MILLION POUNDS)</i>	95
<i>FIGURE 26 GLOBAL FORECAST OF PHOSPHORUS-BASED FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, 2009–2014 (MILLION POUNDS)</i>	96
OTHER FLAME-RETARDANT CHEMICALS	96
BORON-BASED FLAME-RETARDANT CHEMICALS	97
Boron Properties	97
Zinc Borate	97
Boron Sources	98
Boron Grades	98
MOLYBDENUM-BASED FLAME-RETARDANT CHEMICALS	98
Molybdenum Properties	99
Molybdenum Sources.....	99
NANOCOMPOSITE FLAME-RETARDANT CHEMICALS	99
<i>In-Situ</i> Polymerization	100
Solvent-Method.....	100
Melt-Intercalation.....	100
Nanocomposite Properties.....	101
Nanocomposite Sources	101
GRAPHITE-BASED FLAME-RETARDANT CHEMICALS	101
Graphite Properties	101
Graphite Sources	102
MARKET SIZE FOR OTHER FLAME-RETARDANT CHEMICALS.....	102
<i>TABLE 46 GLOBAL FORECAST OF OTHER FLAME-RETARDANT CHEMICALS CONSUMPTION BY END USE, THROUGH 2014 (MILLION POUNDS)</i>	102
<i>FIGURE 27 GLOBAL SHARE OF OTHER FLAME-RETARDANT CHEMICALS CONSUMPTION BY END USE, 2008 (%)</i>	103

<i>TABLE 47 GLOBAL FORECAST OF OTHER FLAME-RETARDANT CHEMICALS MARKET BY END USE, THROUGH 2014 (\$ MILLIONS)</i>	104
<i>FIGURE 28 GLOBAL FORECAST OF OTHER FLAME-RETARDANT CHEMICALS MARKET BY END USE, 2008–2014 (\$ MILLIONS)</i>	104
<i>TABLE 48 GLOBAL FORECAST OF OTHER FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, THROUGH 2014 (MILLION POUNDS)</i>	105
<i>FIGURE 29 GLOBAL FORECAST OF OTHER FLAME-RETARDANT CHEMICALS CONSUMPTION BY REGION, 2008–2014 (MILLION POUNDS)</i>	105
CHAPTER FIVE: MARKETS BY APPLICATION.....	106
INTRODUCTION	106
<i>TABLE 49 SOURCE OF U.S. RESIDENTIAL FIRES, 2005 (%)</i>	106
<i>TABLE 50 ITEM FIRST IGNITED IN U.S. RESIDENTIAL FIRES, 2005</i>	107
<i>TABLE 51 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS CONSUMPTION BY APPLICATION, THROUGH 2014 (MILLION POUNDS)</i>	107
<i>FIGURE 30 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS CONSUMPTION, BY APPLICATION, 2008 (%)</i>	108
<i>TABLE 52 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS MARKET BY APPLICATION, THROUGH 2014 (\$ MILLIONS)</i>	109
<i>FIGURE 31 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS MARKET BY APPLICATION, 2009–2014 (\$ MILLIONS)</i>	110
PLASTICS	110
PLASTICS (CONTINUED).....	111
<i>TABLE 53 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS IN PLASTICS CONSUMPTION, THROUGH 2014 (MILLION POUNDS)</i>	112
<i>FIGURE 32 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS CONSUMPTION IN PLASTICS, 2008 (%)</i>	112
<i>FIGURE 32 (CONTINUED)</i>	113
<i>TABLE 54 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS MARKET IN PLASTICS, THROUGH 2014 (\$ MILLIONS)</i>	113
<i>FIGURE 33 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS MARKET IN PLASTICS, 2009–2014 (\$ MILLIONS)</i>	114
<i>TABLE 55 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS MARKET IN PLASTICS BY REGION, THROUGH 2014 (\$ MILLIONS)</i>	115
<i>FIGURE 34 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS MARKET IN PLASTICS BY REGION, 2009–2014 (\$ MILLIONS)</i>	115

PLASTICS (CONTINUED).....	116
FLAME RETARDANT USE IN PLASTICS.....	117
<i>TABLE 56 METHODS OF FLAME RETARDING POLYMERS.....</i>	<i>117</i>
<i>TABLE 57 CRITERIA FOR SELECTING FLAME-RETARDANT</i>	
<i>CHEMICALS.....</i>	<i>118</i>
<i>TABLE 58 TYPES OF PLASTICS USING FLAME-RETARDANT</i>	
<i>CHEMICALS.....</i>	<i>118</i>
<i>TABLE 58 (CONTINUED).....</i>	<i>119</i>
<i>TABLE 59 U.S. PRODUCTION OF IMPORTANT PLASTICS USING</i>	
<i>FLAME-RETARDANT CHEMICALS, 2008 (MILLION POUNDS, %).....</i>	<i>119</i>
<i>FIGURE 35 SHARE OF U.S. PRODUCTION OF IMPORTANT</i>	
<i>PLASTICS USING FLAME-RETARDANT CHEMICALS BY TYPE,</i>	
<i>2008 (%).....</i>	<i>120</i>
<i>TABLE 60 RELATIVE CONSUMPTION OF FLAME RETARDANTS IN</i>	
<i>PLASTICS, 2008 (MILLIONS POUNDS, %).....</i>	<i>121</i>
<i>FIGURE 36 RELATIVE CONSUMPTION OF FLAME RETARDANTS IN</i>	
<i>PLASTICS, 2009 (%).....</i>	<i>121</i>
ACRYLICS.....	122
<i>TABLE 61 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN ACRYLICS, 2008 (%).....</i>	<i>122</i>
<i>FIGURE 37 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN ACRYLICS, 2008 (%).....</i>	<i>123</i>
Alumina Trihydrate in Acrylics.....	123
Antimony Oxide in Acrylics.....	124
Bromine in Acrylics.....	124
Chlorine in Acrylics.....	124
Phosphorus in Acrylics.....	124
Other Chemicals in Acrylics.....	124
EPOXIES.....	125
<i>TABLE 62 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN EPOXIES, 2008 (%).....</i>	<i>125</i>
<i>FIGURE 38 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN EPOXIES, 2008 (%).....</i>	<i>125</i>
Alumina Trihydrate in Epoxies.....	126
Antimony Oxide in Epoxies.....	126
Bromine in Epoxies.....	126
Chlorine in Epoxies.....	126
Phosphorus in Epoxies.....	126
Other Chemicals in Epoxies.....	127
NYLONS.....	127
<i>TABLE 63 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN NYLONS, 2008 (%).....</i>	<i>127</i>
<i>FIGURE 39 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN NYLONS, 2008 (%).....</i>	<i>128</i>

Alumina Trihydrate in Nylons.....	128
Bromine in Nylons.....	128
Chlorine in Nylons.....	129
Phosphorus in Nylons.....	129
Magnesium Hydroxide in Nylons.....	129
Other Chemicals in Nylons	129
PHENOLICS	130
<i>TABLE 64 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN PHENOLICS, 2008 (%).....</i>	<i>130</i>
<i>FIGURE 40 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN PHENOLICS, 2008 (%).....</i>	<i>131</i>
Alumina Trihydrate in Phenolics.....	131
Antimony Oxide in Phenolics.....	131
Bromine in Phenolics.....	131
Chlorine in Phenolics	132
Other Chemicals	132
POLYCARBONATES.....	132
<i>TABLE 65 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN POLYCARBONATES, 2008 (%).....</i>	<i>133</i>
<i>FIGURE 41 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN POLYCARBONATES, 2008 (%).....</i>	<i>133</i>
Bromine in Polycarbonates	133
Other Chemicals in Polycarbonates.....	134
POLYESTERS.....	134
<i>TABLE 66 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN POLYESTERS, 2008 (%)</i>	<i>134</i>
<i>FIGURE 42 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN POLYESTERS, 2008 (%)</i>	<i>135</i>
Alumina Trihydrate in Polyesters	135
Antimony Oxide in Polyesters.....	135
Bromine in Polyesters	136
Chlorine in Polyesters	136
Phosphorus in Polyesters	136
Melamine in Polyesters	136
Other Chemicals in Polyesters.....	136
POLYETHYLENES	137
<i>TABLE 67 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN POLYETHYLENES, 2008 (%).....</i>	<i>137</i>
<i>FIGURE 43 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN POLYETHYLENES, 2008 (%).....</i>	<i>138</i>
Antimony Oxide in Polyethylene	138
Bromine in Polyethylene	138
Chlorine in Polyethylene.....	139
Magnesium Hydroxide in Polyethylene.....	139

Other Chemicals in Polyethylene	139
POLYPROPYLENE.....	139
<i>TABLE 68 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN POLYPROPYLENES, 2008 (%).....</i>	<i>140</i>
<i>FIGURE 44 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN POLYPROPYLENES, 2008 (%).....</i>	<i>140</i>
Alumina Trihydrate in Polypropylene.....	141
Chlorine in Polypropylene.....	141
Magnesium Hydroxide in Polypropylene.....	141
<i>TABLE 69 EFFECT OF MAGNESIUM HYDROXIDE ON</i>	
<i>POLYPROPYLENE</i>	<i>142</i>
Other Chemicals in Polypropylene	142
POLYURETHANE	142
<i>TABLE 70 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN POLYURETHANES, 2008 (%).....</i>	<i>143</i>
<i>FIGURE 45 GLOBAL SHARE OF FLAME RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN POLYURETHANES, 2008 (%).....</i>	<i>143</i>
Alumina Trihydrate in Polyurethane	144
Chlorine in Polyurethane	144
Phosphorus in Polyurethanes	144
<i>TABLE 71 NITROGEN-PHOSPHORUS SYNERGY IN</i>	
<i>POLYURETHANES (%).....</i>	<i>145</i>
Melamine in Polyurethanes	145
Other Chemicals in Polyurethanes.....	145
POLYVINYL CHLORIDE.....	145
<i>TABLE 72 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN POLYVINYL CHLORIDES, 2008 (%).....</i>	<i>146</i>
<i>FIGURE 46 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN POLYVINYL CHLORIDES, 2008 (%).....</i>	<i>147</i>
Alumina Trihydrate in PVC.....	147
Antimony Oxide in PVC	147
Bromine in PVC.....	148
Chlorine in PVC.....	148
Phosphorus in PVC.....	148
Magnesium Hydroxide in PVC.....	148
<i>TABLE 73 EFFECTS OF MAGNESIUM HYDROXIDE IN POLYVINYL</i>	
<i>CHLORIDE</i>	<i>149</i>
Other Chemicals in PVC	149
STYRENES.....	149
<i>TABLE 74 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN STYRENES, 2008 (%).....</i>	<i>150</i>
<i>FIGURE 47 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS</i>	
<i>PRODUCT MARKET USED IN STYRENES, 2008 (%).....</i>	<i>150</i>
Alumina Trihydrate in Styrenes.....	151

Antimony Oxide in Styrenes	151
Bromine in Styrenes	151
Chlorine in Styrenes.....	151
Phosphorus in Styrenes.....	152
Magnesium Hydroxide in Styrenes.....	152
Other Chemicals in Styrenes	152
TEXTILES.....	152
TEXTILE CLASSIFICATIONS	153
Non-Durable	153
Semi-Durable.....	154
Durable.....	154
TYPES OF TEXTILES	154
Natural Fibers	154
Synthetic Fabrics.....	155
Blended Fabrics	155
MARKET SIZE OF FLAME-RETARDANT CHEMICALS IN TEXTILES.....	155
<i>TABLE 75 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS CONSUMPTION IN TEXTILES, THROUGH 2014 (MILLION POUNDS)</i>	155
<i>FIGURE 48 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS CONSUMPTION IN TEXTILES, 2008 (%)</i>	156
<i>TABLE 76 GLOBAL FORECAST OF THE FLAME-RETARDANT CHEMICALS MARKET IN TEXTILES, THROUGH 2014 (\$ MILLIONS)</i>	157
<i>FIGURE 49 GLOBAL FORECAST OF THE FLAME-RETARDANT CHEMICALS MARKET SIZE AND GROWTH IN TEXTILES, 2008– 2014 (\$ MILLIONS)</i>	157
<i>TABLE 77 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS USED FOR TEXTILES BY REGION, THROUGH 2014 (\$ MILLIONS)</i>	158
<i>FIGURE 50 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS USED FOR TEXTILES BY REGION, 2008–2014 (\$ MILLIONS)</i>	159
WOOD/PAPER	159
MARKET FOR FLAME-RETARDANT CHEMICALS IN WOOD/PAPER.....	160
<i>TABLE 78 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS CONSUMPTION IN WOOD AND PAPER, THROUGH 2014 (MILLION POUNDS)</i>	160
<i>FIGURE 51 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS CONSUMPTION IN WOOD AND PAPER, 2008 (%)</i>	161

<i>TABLE 79 GLOBAL FORECAST OF THE FLAME-RETARDANT CHEMICALS MARKET IN WOOD AND PAPER, THROUGH 2014 (\$ MILLIONS)</i>	162
<i>FIGURE 52 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS MARKET IN WOOD AND PAPER, 2008–2014 (\$ MILLIONS)</i>	162
<i>TABLE 80 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICAL SALES USED FOR WOOD BY REGION, THROUGH 2014 (\$ MILLIONS)</i>	163
<i>FIGURE 53 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICAL SALES USED FOR WOOD BY REGION, 2008–2014 (\$ MILLIONS)</i>	163
<i>COATINGS/PAINTS</i>	164
<i>WORLDWIDE MARKET FOR FLAME-RETARDANT CHEMICALS IN COATINGS AND PAINTS</i>	164
<i>TABLE 81 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS CONSUMPTION USED IN COATINGS/PAINTS, THROUGH 2014 (MILLION POUNDS)</i>	164
<i>TABLE 81 (CONTINUED)</i>	165
<i>FIGURE 54 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS CONSUMPTION USED IN COATINGS/PAINTS, 2008 (%)</i>	165
<i>TABLE 82 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS SALES IN COATINGS/PAINTS, THROUGH 2014 (\$ MILLIONS)</i>	166
<i>FIGURE 55 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS SALES IN COATINGS/PAINTS, 2008–2014 (\$ MILLIONS)</i>	166
<i>TABLE 83 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS SALES USED IN COATINGS/PAINTS, BY REGION, THROUGH 2014 (\$ MILLIONS)</i>	167
<i>FIGURE 56 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS SALES USED IN COATINGS/PAINTS, BY REGION, 2008–2014 (\$ MILLIONS)</i>	167
<i>COATINGS/CONSTRUCTION</i>	168
<i>MARKET FOR FLAME-RETARDANT CHEMICALS IN COATINGS/CONSTRUCTION</i>	168
<i>TABLE 84 GLOBAL FORECAST OF THE FLAME-RETARDANT CHEMICALS MARKET USED IN CONSTRUCTION COATINGS, THROUGH 2014 (MILLION POUNDS)</i>	169
<i>FIGURE 57 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS MARKET USED IN CONSTRUCTION COATINGS, 2008 (%)</i>	169
<i>FIGURE 57 (CONTINUED)</i>	170

<i>TABLE 85 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS MARKET USED IN CONSTRUCTION COATINGS, THROUGH 2014 (\$ MILLIONS)</i>	170
<i>FIGURE 58 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS MARKET USED IN CONSTRUCTION COATINGS, 2008–2014 (\$ MILLIONS)</i>	171
<i>TABLE 86 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS SALES USED IN CONSTRUCTION BY REGION, THROUGH 2014 (\$ MILLIONS)</i>	171
<i>FIGURE 59 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS SALES USED IN CONSTRUCTION BY REGION, 2008–2014 (\$ MILLIONS)</i>	172
COATINGS/DECORATIONS	172
MARKET FOR FLAME-RETARDANT CHEMICALS IN COATINGS/DECORATIONS	173
<i>TABLE 87 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS CONSUMPTION USED IN COATINGS FOR DECORATIONS, THROUGH 2014 (MILLION POUNDS)</i>	174
<i>FIGURE 60 GLOBAL SHARE OF FLAME-RETARDANT CHEMICALS MARKET USED IN COATINGS FOR DECORATIONS, 2008 (%)</i>	174
<i>FIGURE 60 (CONTINUED)</i>	175
<i>TABLE 88 GLOBAL FORECAST OF THE FLAME-RETARDANT CHEMICALS MARKET USED IN COATINGS FOR DECORATIONS, THROUGH 2014 (\$ MILLIONS)</i>	175
<i>FIGURE 61 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS MARKET USED IN COATINGS FOR DECORATIONS, 2008–2014 (\$ MILLIONS)</i>	176
<i>TABLE 89 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS SALES USED IN DECORATIVE COATINGS BY REGION, THROUGH 2014 (\$ MILLIONS)</i>	176
<i>FIGURE 62 GLOBAL FORECAST OF FLAME-RETARDANT CHEMICALS SALES USED IN DECORATIVE COATINGS BY REGION, 2008–2014 (\$ MILLIONS)</i>	177
CHAPTER SIX: INDUSTRY STRUCTURE.....	178
INDUSTRY ENVIRONMENT.....	178
IMPORTANT STRATEGIES.....	179
DRIVING FORCES.....	179
TECHNOLOGY.....	180
METHODS OF MANUFACTURE	181
PATENT ACTIVITY	182
<i>TABLE 90 FLAME-RETARDANT CHEMICAL PATENT ACTIVITY BY COMPANY, 2001–2008</i>	182
<i>TABLE 90 (CONTINUED)</i>	183

<i>TABLE 91 RECENT PATENT ACTIVITY BY FLAME-RETARDANT CHEMICAL, 2001–2008</i>	184
<i>TABLE 92 RECENT PATENT ACTIVITY BY APPLICATION, 2001–2008</i>	184
<i>TABLE 93 RECENT PATENT ACTIVITY BY REGION, 2001–2008</i>	185
MARKET SHARES OF FLAME-RETARDANT CHEMICALS PRODUCERS.....	185
<i>TABLE 94 ESTIMATED U.S. MARKET SHARE FOR THE LEADING FLAME-RETARDANT CHEMICAL PRODUCERS, 2008 (%)</i>	186
<i>TABLE 95 COMPANIES INVOLVED IN VARIOUS FLAME- RETARDANT CHEMICAL MARKETS</i>	187
PROFILES OF COMPANIES INVOLVED IN FLAME-RETARDANT CHEMICALS	187
AKZONOBEL, INC.	187
ALBEMARLE CORPORATION	188
Albemarle Corporation (Continued)	189
<i>TABLE 96 MAJOR FLAME RETARDANT PRODUCT LINES AVAILABLE FROM ALBEMARLE CORPORATION</i>	191
ALCAN CHEMICALS, INC.	191
ALMATIS, INC.	192
ALUMINUM COMPANY OF AMERICA (ALCOA, INC.).....	192
AMERIBROM, INC.	193
AMPACET CORPORATION	193
AMSPEC CHEMICAL CORPORATION.....	193
ARKEMA INC.	194
BARRICADE INTERNATIONAL, INC.....	194
BASF-SE COMPANY	195
BAYER AG	196
CHEMTURA CORPORATION	196
CHINESE PRODUCERS	196
CIBA INC.....	197
CLARIANT SPECIALTY CHEMICALS	198
DAIHACHI CHEMICAL INDUSTRY CO. LTD	199
DEAD SEA BROMINE GROUP LTD	199
DEAD SEA PERICLASE LTD.....	200
DIC CORPORATION	200
DOVER CHEMICAL CORPORATION	201
FRANKLIN INDUSTRIAL MINERALS	201
GREAT LAKES CHEMICAL COMPANY.....	202
<i>TABLE 97 MAJOR FLAME RETARDANT PRODUCT LINES AVAILABLE FROM GREAT LAKES CHEMICAL (A CHEMTURA COMPANY)</i>	203
<i>TABLE 97 (CONTINUED)</i>	204
HUBER ENGINEERED MATERIALS	205
INTERPLASTIC CORPORATION	206

ISRAEL CHEMICALS LTD.....	206
ISRAEL CHEMICALS LTD. INDUSTRIAL PRODUCTS (ICL- IP)	207
ICL PERFORMANCE PRODUCTS LP.....	208
INTERNATIONAL PROTECTIVE COATINGS CORP.....	209
KYOWA CHEMICAL INDUSTRY COMPANY, LTD.....	210
LANXESS	210
MARTIN MARIETTA MAGNESIA SPECIALTIES LLC.....	211
NANOCOR INC.....	211
NYACOL NANO TECHNOLOGIES, INC.	212
OCCIDENTAL CHEMICAL CORPORATION (OXYCHEM).....	212
RHODIA GROUP	213
R.J. MARSHALL COMPANY	214
ROHM & HAAS SPECIALTY MAGNESIA	214
SHERWIN-WILLIAMS.....	215
ROCKWOOD CLAY ADDITIVES GMBH.....	215
SUPRESTA, LLC	216
TOR MINERALS INTERNATIONAL INC.....	217
TOSOH CORPORATION.....	217
U.S. ANTIMONY SALES CORPORATION.....	218
U.S. BORAX INC.....	218
VELSICOL CHEMICAL CORPORATION	219
 APPENDIX.....	 220
OTHER FLAME RETARDANT COMPANIES AND THEIR PRODUCTS	220
APEX CHEMICAL CORPORATION	220
CHINA NATIONAL CHEMICAL CONSTRUCTION	220
CYTEC INDUSTRIES, INC.....	220
DAIHACHI CHEMICAL INDUSTRY	220
DOW CHEMICAL COMPANY	221
DUPONT.....	221
ITALMATCH CHEMICALS S.P.A.	221
NABALTEC	221
SAKAMOTO YAKUHIN KOGYO CO., LTD.....	221
SPARTAN FLAME RETARDANTS	222
TATEHO CHEMICAL INDUSTRIES CO., LTD.	222
OTHER ORGANIZATIONS OF INTEREST	222
ALLIANCE FOR CONSUMER FIRE SAFETY IN EUROPE.....	222
AMERICAN ASSOCIATION OF STATE FIRE MARSHALS.....	222
AMERICAN FIRE SAFETY COUNCIL (AFSC).....	222
BROMINE SCIENCE AND ENVIRONMENTAL FORUM (BSEF)	223
EUROPEAN BROMINATED FLAME RETARDANT INDUSTRY PANEL.....	223

EUROPEAN FLAME RETARDANTS ASSOCIATION (EFRA)	223
FEDERAL AVIATION ADMINISTRATION	223
GROUPEMENT TECHNIQUE FRANÇAIS CONTRE L'INCENDIE	223
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY.....	224
UNDERWRITERS LABORATORY	224