

INTRODUCTION .....	XIX
STUDY GOAL AND OBJECTIVES .....	XIX
REASONS FOR DOING THE STUDY .....	XIX
CONTRIBUTION OF THE STUDY AND FOR WHOM .....	XX
SCOPE AND FORMAT .....	XX
METHODOLOGY .....	XXI
RELATED BCC WORK CREDENTIALS .....	XXII
BCC ON-LINE SERVICES.....	XXIII
INTERNET .....	XXIII
SUMMARY.....	XXIV
<i>SUMMARY TABLE GLOBAL RARE EARTH MARKETS BY REGION, THROUGH 2007</i> <i>(METRIC TONS – REO EQUIVALENT, \$ MILLIONS)</i> .....	XXV
<i>SUMMARY FIGURE GLOBAL RARE EARTH MARKETS BY REGION, 2002 AND 2007</i> <i>(METRIC TONS – REO EQUIVALENT)</i> .....	XXV
RARE EARTH CHEMISTRY, RESOURCES AND PROCESSING	
TECHNOLOGIES OVERVIEW.....	1
BACKGROUND .....	1
RARE EARTH ELEMENTAL CHEMISTRY.....	1
<i>TABLE 1 ABUNDANCE OF LANTHANIDES IN IGNEOUS ROCKS IN THE EARTH'S</i> <i>CRUST (ABUNDANCE IN METRIC TONS [PPM])</i> .....	2
RARE EARTH CHARACTERISTICS .....	3
UNIQUE RARE EARTH PROPERTIES.....	3
<i>TABLE 2 RARE EARTH VALENCE STATES, IONIC RADII, AND TYPICAL COLORS</i> .....	4
USEFUL PROPERTIES OF RARE EARTH-CONTAINING MATERIALS .....	5
<i>TABLE 3 PROPERTIES AND ASSOCIATED USEFUL APPLICATIONS OF RARE</i> <i>EARTHS</i> .....	5
<i>TABLE 3 (CONTINUED)</i> .....	6
Magnetic Properties .....	6
Reaction with Hydrogen.....	6
Ability to Replace Alkali Metal Ions.....	6
High Slow Neutron Capture Cross Section .....	7
Oxygen Gettering.....	7
Reactivity with Oxygen and Sulfur .....	7
Fluorescence.....	7
Other Useful Properties .....	8
ENVIRONMENTAL, HEALTH AND SAFETY ISSUES .....	8
GOVERNMENT REGULATIONS.....	9
TOXICOLOGY AND RADIOACTIVITY .....	9
<i>TABLE 4 SELECTED LD<sub>50</sub> VALUES PER ORAL INGESTION (MG/KG)</i> .....	10
Thorium.....	11
RARE EARTH RESOURCES AND MINING.....	11
WORLD RESERVES OF RARE EARTHS .....	11

<i>TABLE 5 RARE EARTH RESERVES, 2001 (1,000 METRIC TONS – REO EQUIVALENTS)</i> .....	12
TYPES OF RARE EARTH ORES.....	12
Bastnasite .....	13
Monazite.....	14
Xenotime .....	14
Other Sources .....	15
RARE EARTH ORE BODY COMPOSITIONS .....	16
<i>TABLE 6 TYPICAL RARE EARTH ORE BODY COMPOSITIONS (TOTAL %)</i> .....	17
RARE EARTH MINING TECHNIQUES .....	17
Placer Mining.....	17
Open Pit Mining .....	18
Underground Room and Pillar Mining .....	18
RARE EARTH MINING ACTIVITY .....	18
Bastnasite Resources.....	19
Monazite Resources .....	19
Australia Projects .....	19
India Projects.....	20
Development .....	20
China .....	20
Price Factors .....	21
<i>TABLE 7 INTERNATIONAL RARE EARTH MINE PRODUCTION OUTLOOK, THROUGH 2007 (METRIC TONS OF RARE EARTH OXIDE)</i> .....	21
RARE EARTH EXTRACTION/SEPARATION/PROCESSING .....	22
BENEFICIATION .....	22
Placer Deposit Processing .....	23
Mountain Pass and Baiyunebo .....	23
CHEMICAL TREATMENT .....	24
Treatment of Bastnasite.....	24
Treatment of Monazite .....	25
Treatment of Xenotime.....	26
Other Chemical Treatment .....	26
FINAL PROCESSING/SEPARATION .....	27
Final Processing by Fractionation .....	27
Final Processing by Oxidation-Reduction .....	28
Final Processing by Cerium Oxidation.....	28
Final Processing by Euronium Reduction .....	28
Other Oxidation-Reduction Processes for Separation .....	29
Final Processing by Fractional Crystallization Methods.....	29
Final Processing by Solvent-Solvent Extraction .....	29
Final Processing by Solvent-Solvent Extraction	
(Continued) .....	30
Final Separation Techniques .....	31
Ion Exchange Separation .....	32
Microbial Extraction.....	33

RARE EARTH METALS, OXIDES AND PRODUCTS .....	33
TABLE 8 GLOBAL RARE EARTH DEMAND BY COMPOUNDS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....	34
Rare Earth Chlorides .....	34
Cerium and Other Rare Earth Oxides and Compounds .....	35
Cerium Oxide and Compounds .....	35
Yttrium Compounds .....	35
Other Rare Earth Oxides and Compounds.....	36
Rare Earth Metals.....	36
Reduction Processes.....	36
Oxide Reduction.....	37
New Development.....	37
Electrolytic Reduction.....	37
Refining .....	38
Rare Earth Alloys .....	38
SUPPLY/DEMAND RELATIONSHIPS.....	39
FIGURE 1 RARE EARTH SUPPLY/DEMAND RELATIONSHIP, THROUGH 2007 (THOUSANDS OF METRIC TONS).....	40
PRICING .....	41
BACKGROUND .....	42
TABLE 9 EVOLUTION OF RARE EARTH PRICING INFLUENCES, 1950-2002.....	42
SUPPLY DISRUPTION .....	42
SHORTAGES AND OVERSUPPLY.....	42
TABLE 10 RARE EARTH PRICES, 1996-2002 (\$/KILOGRAM).....	43
CO-PRODUCTION.....	43
TRENDS .....	43
RARE EARTH PRODUCT APPLICATIONS .....	44
OVERVIEW.....	44
TABLE 11 GLOBAL RARE EARTH APPLICATIONS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT, \$ MILLIONS).....	44
FIGURE 2 RARE EARTH APPLICATIONS, 2002.....	45
CATALYSTS .....	46
REGIONAL MARKETS .....	46
FIGURE 3 RARE EARTH CATALYST MARKET BY REGION, 2002.....	47
CATALYTIC CHEMISTRY.....	47
TABLE 12 CATALYST APPLICATIONS BY ELEMENT.....	48
TABLE 13 RARE EARTH CATALYST CHEMISTRY.....	48
TABLE 13 (CONTINUED) .....	49
RARE EARTH CATALYST APPLICATIONS.....	49
FIGURE 4 RARE EARTH CATALYST MARKET BY APPLICATION, 2002 .....	50
Fluid Catalytic Cracking.....	50
Fluid Catalytic Cracking (Continued).....	51
Automotive Exhaust Catalysts .....	52
Environmental Catalysts .....	53
Polymer/Elastomer Catalysts .....	53
Chemical Processing and Other Catalysts .....	54

	Oxidation Catalysts .....	55
	Amidoxidation of Acrylonitrile .....	55
	Dewaxing Catalysts .....	55
	Reagents for Chemical Synthesis.....	56
	Corrosion Inhibitors.....	57
	NMR Reagents .....	57
	Other.....	57
	<b>RARE EARTH CATALYST OUTLOOK.....</b>	<b>58</b>
<i>TABLE 14</i>	<i>RARE EARTH CATALYST MARKET OUTLOOK BY REGION, THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....</i>	<i>58</i>
<i>TABLE 15</i>	<i>RARE EARTH CATALYST OUTLOOK BY APPLICATION, THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....</i>	<i>59</i>
	<b>MAGNETS.....</b>	<b>59</b>
	<b>REGIONAL MARKETS .....</b>	<b>60</b>
<i>FIGURE 5</i>	<i>RARE EARTH MAGNET MARKET BY REGION, 2002 .....</i>	<i>60</i>
	<b>TYPES OF RARE EARTH MAGNETS .....</b>	<b>61</b>
	Samarium-Cobalt and Related Magnetic Materials .....	61
	Rare Earth Cobalt-5 Compounds .....	62
	Rare Earth 2 Transition Metal 17 Group .....	62
<i>TABLE 16</i>	<i>NOMINAL PHYSICAL AND MECHANICAL PROPERTIES OF RARE EARTH/CO<sub>5</sub>, RARE EARTH<sub>2</sub>/CO<sub>17</sub>, AND ALNICO MAGNETS .....</i>	<i>63</i>
	Neodymium-Iron-Boron and Related Magnetic Materials .....	64
	Rapidly Solidified Nd-Fe-B Magnets .....	65
	Powdered Metallurgy Nd-Fe-B Magnets .....	66
	Processing Rare Earths for Magnetic Applications .....	66
	<b>RARE EARTH MAGNET APPLICATIONS.....</b>	<b>67</b>
<i>TABLE 17</i>	<i>RARE EARTH MAGNET APPLICATIONS .....</i>	<i>67</i>
	Magneto-Optic Recording.....	68
	Magnetic Refrigeration.....	68
	Magnetostriiction.....	69
	<b>RARE EARTH MAGNET OUTLOOK.....</b>	<b>69</b>
<i>TABLE 18</i>	<i>RARE EARTH MAGNET MARKETS BY REGION, THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....</i>	<i>70</i>
<i>TABLE 19</i>	<i>RARE EARTH MAGNET OUTLOOK BY TYPE, THROUGH 2007 (METRIC TONS – REO EQUIVALENT) .....</i>	<i>70</i>
	<b>METALLURGY .....</b>	<b>71</b>
	<b>REGIONAL MARKETS .....</b>	<b>71</b>
<i>FIGURE 6</i>	<i>RARE EARTH METALLURGY MARKET BY REGION, 2002 .....</i>	<i>71</i>
	<b>RARE EARTH METALLURGICAL APPLICATIONS .....</b>	<b>72</b>
	Nodular Iron and Gray Iron.....	72
	Steel.....	73
	Superalloys .....	74
	Magnesium and Aluminum Alloys .....	75
	Other .....	76
	Mischmetal.....	76
	Research and Other Uses .....	76
	<b>RARE EARTH METALLURGICAL OUTLOOK.....</b>	<b>77</b>

<i>TABLE 20 RARE EARTH METALLURGY MARKET OUTLOOK BY REGION, THROUGH 2007 (METRIC TONS – REO EQUIVALENT)</i> .....	78
<i>TABLE 21 RARE EARTH METALLURGY OUTLOOK BY APPLICATION, THROUGH 2007 (METRIC TONS – REO EQUIVALENT)</i> .....	78
GLASS AND CERAMICS.....	79
REGIONAL MARKETS .....	79
<i>FIGURE 7 RARE EARTH GLASS AND CERAMICS MARKET BY REGION, 2002</i> .....	80
GLASS APPLICATIONS .....	80
<i>FIGURE 8 RARE EARTH GLASS MARKET BY APPLICATION, 2002</i> .....	81
Glass Polishing .....	81
<i>FIGURE 9 RARE EARTH GLASS POLISHING MARKETS BY APPLICATION, 2002</i> .....	82
Chemistry.....	82
Monitors and Optical Devices .....	83
Ophthalmic Market.....	83
Other Applications .....	83
Glass Decolorizing .....	83
Ceric Oxide.....	84
Ceric Ion .....	84
Praseodymium .....	84
Erbium Oxide.....	84
Colorizing .....	85
Neodymium .....	85
Praseodymium .....	85
Erbium.....	86
Other Additives.....	86
Optical Glass.....	86
Specialty/Halide Glasses .....	87
Barium Fluoride-Based Glass .....	87
<i>TABLE 22 HEAVY METAL FLUORIDE GLASS COMPOSITIONS</i> .....	88
Pigments.....	88
Oxyfluoride Glass-Ceramic.....	88
Concentration Quenching .....	88
Advantages and Disadvantages.....	89
Other Compounds .....	89
Radiation Resistant Glass.....	89
Other Glass Applications .....	90
CERAMIC APPLICATIONS.....	90
<i>FIGURE 10 RARE EARTH CERAMICS MARKET BY APPLICATION, 2002</i> .....	91
Structural Ceramics .....	92
Nitride Ceramics.....	92
Densification.....	92
Yttria-Stabilized Zirconia Silicon Nitride.....	93
Ceramic Extrudates .....	93
Piezoelectric Ceramics .....	93
Yttria-Stabilized Zirconia (YSZ).....	94

Yttrium Oxide-Titanium Carbide-Titanium Boride	
Eutectics.....	95
Alumina.....	95
Fiber-Reinforced Concrete.....	95
Artificial Gems.....	95
PLZT Ceramics.....	96
Functional Ceramics.....	96
Sensors and Thermistors.....	96
Sensors.....	96
Biosensors.....	97
Thermistors.....	97
Oxidic Semiconductor Ceramic	
Thermistors.....	98
Spark Plugs.....	99
Optical Data Storage.....	99
Other Electronics.....	99
Fuel Cells.....	100
PLZT Ceramics.....	101
High-Temperature Applications.....	101
Enamels.....	101
Miscellaneous Ceramic Applications.....	102
RARE EARTH GLASS AND CERAMIC OUTLOOK.....	102
TABLE 23 RARE EARTH GLASS AND CERAMICS MARKET OUTLOOK BY REGION, THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....	103
TABLE 24 RARE EARTH GLASS AND CERAMIC OUTLOOK BY APPLICATION, THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....	103
TABLE 25 RARE EARTH GLASS ADDITIVES BY APPLICATION, THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....	104
TABLE 26 RARE EARTH ELECTRONIC CERAMICS BY APPLICATION, THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....	104
ELECTRONICS.....	105
REGIONAL MARKETS.....	105
FIGURE 11 RARE EARTH ELECTRONICS MARKET BY REGION, 2002.....	105
FIGURE 11 (CONTINUED).....	106
RARE EARTH ELECTRONICS APPLICATIONS.....	106
Phosphors.....	106
Consumer Phosphors.....	106
Consumer Phosphors (Continued).....	107
Medical Imaging Phosphors.....	108
Lamp Phosphors.....	109
Fluorescent Lights.....	109
High Intensity Lights.....	110
Auer Incandescent Mantles.....	110
Fiber Optics.....	111
Telecommunications.....	111
Sensors.....	112

Double-Clad Optical Fiber.....	113
Other Electronics.....	113
Lasers .....	113
Pentaphosphates.....	114
Promethium-Based Lasers.....	114
Other Developments.....	114
RARE EARTH ELECTRONICS OUTLOOK .....	115
TABLE 27 RARE EARTH ELECTRONICS MARKET OUTLOOK BY REGION, THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....	115
TABLE 28 RARE EARTH ELECTRONICS BY APPLICATION, THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....	115
OTHER .....	116
FIGURE 12 OTHER RARE EARTH MARKETS BY APPLICATION, 2002.....	116
REGIONAL MARKETS .....	117
FIGURE 13 OTHER RARE EARTH APPLICATIONS BY REGION, 2002.....	117
HYDROGEN STORAGE AND SEPARATION MARKETS.....	118
Hydrogen Storage in Nickel-Metal Hydride Batteries.....	119
Hydrogen Separation in Process Streams .....	120
Other Applications for Hydrogen Storage Materials .....	120
GARNET.....	120
CARBON ARC ELECTRODES .....	121
NUCLEAR .....	121
SUPERCONDUCTORS .....	122
BACKGROUND .....	122
APPLICATIONS.....	123
OXIDE SUPERCONDUCTOR WIRE .....	123
Disadvantages.....	124
Research and Development.....	124
TABLE 29 RARE EARTH SUPERCONDUCTOR RANDD INSTITUTIONS .....	125
TABLE 30 RARE EARTH SUPERCONDUCTOR APPLICATIONS.....	126
OTHER APPLICATIONS .....	127
Textiles.....	127
Coatings .....	127
Other Industrial Applications.....	127
Medical Applications .....	128
Agricultural Applications.....	128
Chemistry Applications.....	128
OTHER APPLICATIONS RARE EARTH OUTLOOK .....	128
TABLE 31 OTHER RARE EARTH MARKET OUTLOOK BY REGION, THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....	129
TABLE 32 OTHER RARE EARTH MARKET OUTLOOK BY APPLICATION, THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....	129
Other Applications Rare Earth Outlook (Continued) .....	130
INTERNATIONAL RARE EARTH MARKETS .....	131
OVERVIEW.....	131
FIGURE 14 REGIONAL RARE EARTH MARKETS, 2002.....	131

TABLE 33 GLOBAL RARE EARTH MARKETS BY REGION, THROUGH 2007 (METRIC TONS – REO EQUIVALENT, \$ MILLIONS) .....	132
NORTH AMERICA .....	133
TABLE 34 NORTH AMERICAN RARE EARTH MARKET BY APPLICATION, THROUGH 2007 (METRIC TONS – REO EQUIVALENT) .....	133
CATALYSTS .....	134
TABLE 35 NORTH AMERICAN RARE EARTH CATALYST MARKETS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT) .....	134
MAGNETS .....	135
TABLE 36 NORTH AMERICAN RARE EARTH MAGNET MARKETS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT) .....	135
METALLURGY .....	136
TABLE 37 NORTH AMERICAN RARE EARTH METALLURGY MARKETS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT) .....	136
GLASS AND CERAMICS .....	136
TABLE 38 NORTH AMERICAN RARE EARTH GLASS AND CERAMICS MARKETS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT) .....	136
WESTERN EUROPE .....	137
TABLE 39 WESTERN EUROPEAN RARE EARTH APPLICATIONS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT) .....	137
CATALYSTS .....	138
TABLE 40 WESTERN EUROPEAN RARE EARTH CATALYST MARKETS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT) .....	138
MAGNETS .....	139
TABLE 41 WESTERN EUROPEAN RARE EARTH MAGNET MARKETS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT) .....	139
METALLURGY .....	139
TABLE 42 WESTERN EUROPEAN RARE EARTH METALLURGY MARKETS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT) .....	139
GLASS AND CERAMICS .....	140
TABLE 43 WESTERN EUROPEAN RARE EARTH GLASS AND CERAMICS MARKETS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT) .....	140
JAPAN .....	140
TABLE 44 JAPANESE RARE EARTH APPLICATIONS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT) .....	141
CATALYSTS .....	141
TABLE 45 JAPANESE RARE EARTH CATALYST MARKETS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT) .....	141
MAGNETS .....	142
TABLE 46 JAPANESE RARE EARTH MAGNET MARKETS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT) .....	142
METALLURGY .....	142
TABLE 47 JAPANESE RARE EARTH METALLURGY MARKETS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT) .....	142
GLASS AND CERAMICS .....	143
TABLE 48 JAPANESE RARE EARTH GLASS AND CERAMICS MARKETS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT) .....	143
OTHER ASIA/PACIFIC .....	143
CHINA .....	143
Baotou .....	144



Processing Activity .....	144
Research and Development.....	144
Outlook.....	145
<i>TABLE 49 OTHER ASIA/PACIFIC RARE EARTH APPLICATIONS, THROUGH 2007</i> <i>(METRIC TONS – REO EQUIVALENT).....</i>	<i>145</i>
CATALYSTS.....	146
<i>TABLE 50 OTHER ASIA/PACIFIC RARE EARTH CATALYST MARKETS, THROUGH</i> <i>2007 (METRIC TONS – REO EQUIVALENT).....</i>	<i>146</i>
Automotive Market.....	146
MAGNETS.....	147
<i>TABLE 51 OTHER ASIA/PACIFIC RARE EARTH MAGNET MARKETS, THROUGH</i> <i>2007 (METRIC TONS – REO EQUIVALENT).....</i>	<i>147</i>
METALLURGY .....	147
<i>TABLE 52 OTHER ASIA/PACIFIC RARE EARTH METALLURGY MARKETS,</i> <i>THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....</i>	<i>147</i>
GLASS AND CERAMICS .....	148
<i>TABLE 53 OTHER ASIA/PACIFIC RARE EARTH GLASS AND CERAMICS</i> <i>MARKETS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....</i>	<i>148</i>
REST OF WORLD (ROW) .....	148
<i>TABLE 54 REST OF WORLD (ROW) RARE EARTH APPLICATIONS, THROUGH 2007</i> <i>(METRIC TONS – REO EQUIVALENT).....</i>	<i>149</i>
CATALYSTS.....	150
<i>TABLE 55 REST OF WORLD (ROW) RARE EARTH CATALYST MARKETS,</i> <i>THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....</i>	<i>150</i>
MAGNETS.....	150
<i>TABLE 56 REST OF WORLD (ROW) RARE EARTH MAGNET MARKETS, THROUGH</i> <i>2007 (METRIC TONS – REO EQUIVALENT).....</i>	<i>150</i>
METALLURGY .....	151
<i>TABLE 57 REST OF WORLD (ROW) RARE EARTH METALLURGY MARKETS,</i> <i>THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....</i>	<i>151</i>
GLASS AND CERAMICS .....	151
<i>TABLE 58 REST OF WORLD (ROW) RARE EARTH GLASS AND CERAMICS</i> <i>MARKETS, THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....</i>	<i>151</i>
RARE EARTH INDUSTRY STRUCTURE.....	152
OVERVIEW.....	152
INNOVATION.....	152
MARKETING .....	153
DISTRIBUTION.....	154
<i>TABLE 59 RARE EARTH CHANNELS OF DISTRIBUTION.....</i>	<i>154</i>
CROSS-SELLING .....	154
OTHER STRATEGIES.....	155
END-USER STRATEGIES .....	155
OPERATIONS.....	155
COSTS .....	155
LABOR.....	156
REGULATIONS .....	156
FINANCIAL PERFORMANCE .....	157

SCOPE OF THE INDUSTRY .....	157
TABLE 60 THREE-TIER RARE EARTH INDUSTRY ENVIRONMENT.....	157
TABLE 61 VALUE-ADDED ALONG THE RARE EARTH VALUE CHAIN, THROUGH 2007 (METRIC TONS – REO EQUIVALENT).....	158
MANAGEMENT STRATEGIES.....	158
CONSOLIDATION.....	159
COMPETITION .....	159
TABLE 62 RARE EARTH CONCENTRATION FACTORS.....	159
TABLE 62 (CONTINUED) .....	160
FIGURE 15 RARE EARTH PROCESSORS MARKET SHARE, 2002.....	161
MARKET SEGMENT LEADERS .....	162
RARE EARTH COMPANIES.....	163
COMPANY PROFILES .....	163
ADVANCED LIGHTING TECHNOLOGIES, INC.....	163
ALDRICH-APL LLC .....	164
ALKANE EXPLORATION NL .....	164
AMR TECHNOLOGIES INC.....	165
APPLIED MAGNET TECHNOLOGY .....	166
ARRIS INTERNATIONAL CORPORATION.....	167
BAOTOU DAOMAO RARE EARTH CO. LTD.....	167
BAOTOU GOLDEN RARE EARTH BIOLOGICAL APPLICATION LTD.....	168
BAOTOU IRON AND STEEL (GROUP) CO. LTD.....	168
BAOTOU JUNTA RARE EARTH CO. LTD.....	169
BAOTOU QITONG RARE EARTH CO. LTD. ....	169
BAOTOU RHODIA CO. LTD.....	170
BEIJING FOUNDER DONGAN RARE EARTHS NEW MATERIALS CO., LTD. ....	170
BOULDER SCIENTIFIC COMPANY .....	171
CATHAY ADVANCED MATERIALS LIMITED .....	172
CERAC, INC.....	173
CHANGSHA RARE EARTH CO. LTD.....	174
CHINA RARE EARTH HOLDINGS LIMITED .....	174
Yixing Xinwei Leeshing Rare Earth .....	175
Yixing Xinwei Leeshing Refractory Materials .....	176
COMPANHIA BRASILEIRA DE METALURGIA E MINERACAO .....	176
COMPANHIA INDUSTRIAL FLUMINENSE.....	177
DAIBECK ADVANCED MATERIALS CO. LTD.....	178
DANDONG JINLONG RARE EARTH CO. LTD.....	178
ELECTRON ENERGY CORPORATION .....	179
ERDOS SANGXING RARE EARTH CO. LTD .....	180
ETREMA PRODUCTS, INC. ....	180
FERRO CORPORATION .....	181
GANSU RARE EARTH CORPORATION LTD.....	182

GANZHOU ADVANCED RESOURCES CO. LTD .....	182
GFS CHEMICALS, INC.....	183
GLOBE METALLURGICAL, INC.....	183
W.R. GRACE AND CO.....	184
HITACHI METALS LTD. ....	185
INDIAN RARE EARTH LTD.....	186
INNER MONGOLIA HEFA RARE EARTH CO. LTD .....	186
JOHNSON MATTHEY PLC .....	187
KERALA MINERALS AND METALS LIMITED .....	188
LESHAN RUIFENG METALLIC CORPORATION .....	189
LINZI NONFERROUS METAL SMELTER OF ZIBO .....	189
LONDON SCANDINAVIAN METALLURGICAL CO LIMITED .....	189
LYNAS CORPORATION LTD.....	190
MACKENZIE CORPORATION .....	191
MAGNEQUENCH INTERNATIONAL, INC.....	191
Magnequench UG/Magnequench GmbH .....	192
Daido Steel Joint Venture .....	192
Other Developments .....	193
MELDFORM METALS LTD. ....	193
METALL RARE EARTH LTD.....	194
MITSUI MINING AND SMELTING CO., LTD.....	195
MOLYCORP, INC. ....	195
Molycorp, Inc. (Continued).....	196
NINGXIA NONFERROUS METALS SMELTERY .....	197
Ningxia Oriet Tantalum Industry .....	197
Jin-Lian Company .....	198
NIPPON YTTRIUM CO. LTD. ....	198
NOAH TECHNOLOGIES CORPORATION .....	199
OM GROUP, INC. ....	199
PALM INTERNATIONAL, INC. ....	200
QIAOXING RARE EARTH METAL HIGH TECHNICAL CO., LTD .....	201
RHODIA SA.....	202
Rhodia SA (Continued).....	203
Anan Kasei.....	204
SANTOKU CORPORATION .....	204
Santoku America .....	205
Santoku America (Continued).....	206
Anan Kasei.....	207
SEIMI CHEMICAL CO., LTD. ....	207
THE SHEPHERD CHEMICAL COMPANY .....	207
SHIN-ETSU CHEMICAL CO., LTD. ....	208
SHOWA DENKO K.K. ....	208
SIGMA-ALDRICH CORPORATION .....	209

SION POWER CORPORATION.....	210
SOLIKAMSK MAGNESIUM WORKS .....	211
STANFORD MATERIALS CORPORATION .....	211
H.C. STARCK GMBH .....	212
Hardmetal Group.....	212
Chemicals and Mill Products Group.....	213
SUMITOMO METAL MINING CO. LTD. ....	214
SUMITOMO SPECIAL METALS CO. LTD.....	214
Sumitomo Special Metals Co. Ltd. (Continued) .....	215
TREIBACHER AUERMET .....	216
XUZHOU JINSHI SPECIAL MATERIAL PLANT.....	217
ZHONGSHAN TIANJIAO RARE EARTH MATERIALS COMPANY .....	217
Zhongshan Tianjiao ... Materials Company (Continued) .....	218

#### APPENDIX: COMPANY LIST BY SPECIFIC RARE EARTH BUSINESS

SEGMENT .....	219
<i>TABLE 63 RARE EARTH COMPANIES BUSINESS LINE REFERENCE</i> .....	219
<i>TABLE 63 (CONTINUED)</i> .....	220
<i>TABLE 63 (CONTINUED)</i> .....	221
<i>TABLE 63 (CONTINUED)</i> .....	222
<i>TABLE 63 (CONTINUED)</i> .....	223
<i>TABLE 63 (CONTINUED)</i> .....	224