



Rigid Transparent Plastics

May 2017

Andrew McWilliams

Report Code: PLS003K

Table of Contents

Chapter 1: Introduction	1
Study Goals and Objectives.....	1
Reasons for Doing This Study.....	1
Scope of Report.....	1
Information Sources.....	2
Methodology.....	2
Geographic Breakdown.....	2
Analyst's Credentials.....	3
Related BCC Research Reports.....	3
Chapter 2: Summary and Highlights	5
Chapter 3: Market and Technology Background	9
Flat Glass	9
Type of Flat Glass.....	9
Conversion to Transparent Plastics	11
Background of Transparent Plastics.....	11
Important Early Developments	12
Current Plastics Choices	13
Problems with Plastics	13
Technology.....	13
Performance Variables	13
Design Considerations.....	21
Chapter 4: Market Breakdown by Technology Type	23
Polycarbonates	24
Impact of Bisphenol A on Polycarbonate Usage	24
Processing.....	24
Advantages and Disadvantages.....	24
Producers	25
Capacity and Demand	25
Polycarbonate Sheet	26
Producer Grades.....	28
Specific Applications.....	28
Selected Trade Names of Polycarbonates.....	29
Market Estimates and Forecasts	29
Acrylics	31
Comparison of PMMA with Glass.....	31
Properties	32
Manufacture of Acrylic Polymers	32
Acrylic Sheet	33
Applications.....	33
Producers	34
Comparison of Acrylics and Polycarbonates	35
Market Estimates and Forecasts	35
Styrenic Resins	36
General Purpose Polystyrene	37

Styrene Copolymers	37
HIPS	38
Recent Changes in Styrenic Polymer Producers.....	38
Global Producers and Industry Leaders	39
Processing.....	39
Applications	40
Market Estimates and Forecasts	41
Styrene Copolymers.....	42
Styrene Block Copolymers.....	42
Styrene-acrylic Copolymers.....	45
Styrene-acrylonitrile Copolymers.....	46
Styrene Methyl Methacrylate	49
Acrylonitrile Butadiene Styrene	50
Properties.....	50
Processing.....	51
Producers	51
General Grades.....	52
ABS Sheets.....	52
General ABS Applications	52
Market Estimates and Forecasts	53
Cellulosics.....	53
Overview	53
Properties.....	54
Types of Transparent Cellulosic Plastics.....	54
Advantages	55
Disadvantages	55
Producers	55
Market Estimates and Forecasts	55
Polyvinyl Chloride.....	56
Forms of PVC	56
Versatility.....	56
Processing.....	57
Consumption Patterns.....	57
Applications of Transparent PVC.....	58
Producers	58
Rigid Transparent PVC Characteristics	58
Environmental Issues	59
Producers	59
Market Estimates and Forecasts	60
Thermoplastic Polyesters (Polyethylene Terephthalate)	60
Major Applications	60
Modified PET Resins	60
Producers	61
Applications.....	63
Market Estimates and Forecasts	63
Polysulfones	64
Properties.....	64
Types of Polysulfones.....	64
Applications.....	65
Producers	65
Market Estimates and Forecasts	65

Allyl Diglycol Carbonate	66
Products, Properties and Applications	66
Trivex Versus Polycarbonate	67
Market Estimates and Forecasts	67
Other Transparent Plastics.....	67
Polypropylene	67
Nylons.....	70
Cyclic Olefin Copolymers.....	73
Market Estimates for Other Rigid Transparent Plastics	73
Transparent Plastics Market Summary.....	74
Chapter 5: Market Breakdown by Application	76
Overview	76
Electronics Applications	76
Optical Disks	76
Other Consumer Electronics	79
Market Estimates and Forecasts	79
Building and Construction Applications.....	79
Background.....	80
Examples of Product Usage.....	80
The U.S. Housing Market.....	80
Market Estimates and Forecasts	81
Glazing	82
Market Estimates and Forecasts	86
Lighting Products.....	86
Signs and Displays	90
Plumbing Fixtures.....	92
Market Estimates and Forecasts	93
Medical Applications.....	95
Overview	95
FDA Activities.....	95
Testing Procedures for Medical Plastics.....	96
Performance Requirements for Medical Plastics.....	97
Medical and Laboratory Ware Regulations for Clear Plastics	97
Plastic Medical and Laboratory Ware Products and Devices.....	97
Additional Requirements of Medical Plastics.....	98
Sterilization Techniques for Medical Plastics	98
Polymer Reactions to Sterilization Methods.....	100
E-Beam Radiation	101
Clarity Requirements for Medical Plastics	102
Clear Plastics in Medical Applications	103
Rigid Transparent Plastic Medical Products	107
Market Estimates and Forecasts	113
Automotive	114
Clear Plastics Usage in Automobiles	114
Summary of Resin Usage in Automotive Lenses	119
Market Estimates and Forecasts	119
Recent Developments in the Automotive Market	120
Housewares.....	120
Environmental Developments.....	121
Market Estimates and Forecasts	121

Appliances	121
Transparent Plastic Applications in Appliances.....	122
Key Appliance Manufacturers	123
Market Estimates and Forecasts	124
Toys	124
Use of Plastics in Toys	125
Clear Plastic Applications in Toys	126
Consumer Product Safety Council.....	126
Market Estimates and Forecasts	126
Optical Lenses	127
Properties and Advantages	127
Market Dynamics	127
Key Concepts in Lens Materials.....	127
Use of Plastics in Lenses	128
Fabrication Methods for Optical Plastic Lenses	129
Key Performance Parameters	130
Advantages of Plastics	131
Use of Clear Plastics	131
Optical Lens Market Segments.....	136
Market Shares	136
Contact Lenses	137
Types of Plastics Used	137
Contact Lens Suppliers	138
Safety Lenses.....	139
American National Standards Institute	139
Military Ballistic Requirements	140
Deficiencies of Glass.....	140
Plastics Choices.....	140
Market Estimates and Forecast.....	141
Aircraft Transparencies.....	141
Glass Transparencies.....	142
Properties.....	142
Clear Plastics Preferences	143
Applications in Military and Commercial Aircraft	143
Important Clear Plastics Suppliers to the Aerospace Industry.....	144
Market Estimates and Forecasts	145
Solar Applications	145
Potential Applications	145
Key Benefits.....	146
Conclusions.....	146
Other Applications	146
Railroads.....	146
Consumer Goods	146
Sports and Leisure	146
Machine Guards and Safety Shielding.....	147
Bathroom Products	147
Other Products	147
Market Estimates and Forecasts	147
Summary of Transparent Plastic Applications	148
Chapter 6: Analysis of Market Opportunities	150

Applications.....	150
Polystyrene and ABS	151
SMMA Resins	151
Comparison of NAS to Acrylics	151
Comparison of Zylar to Polycarbonates	151
Summary of Competition by Application.....	152
Chapter 7: Major Producers and Suppliers and Trade-Named Products	154
Chapter 8: Standards, Tests and Regulations	158
Properties and Testing Methods.....	158
Optical Tests.....	158
Transparent Plastics Code Approvals.....	158
Selected ASTM Codes for Rigid Transparent Plastics.....	159
Other Code Approvals.....	160
Underwriters Laboratories	160
Military Specifications	160
Chapter 9: Company Profiles	162
Appendix: Acronyms	171
About BCC Research.....	173
About BCC Research.....	174
BCC Library Access	174
BCC Custom Research	174

List of Tables

Summary Table: North American Rigid Transparent Plastics Market, by Resin Type, Through 2022 (Million Pounds).....	5
Table 1 Optical Qualities of Rigid Transparent Plastics (1/8 Inch Test Specimen).....	15
Table 2 Sensitivity to UV Radiation of Selected Transparent Plastics.....	17
Table 3 Heat Resistance Levels of Selected Transparent Plastics (°F at 264 psi).....	19
Table 4 Impact Resistance of Selected Transparent Plastics (Feet-Pounds/Inch).....	20
Table 5 Transparent Grade Percentages of Major Plastics (%).....	23
Table 6 Key Polycarbonates Products and Producers.....	25
Table 7 North American Rigid Transparent Polycarbonate Market, by Application, Through 2022 (Million Pounds).....	30
Table 8 North American Market for Rigid Transparent Polycarbonate in Building and Construction Applications, Through 2022 (Million Pounds).....	31
Table 9 North American Market for Rigid Transparent Acrylics, by Application, Through 2022 (Million Pounds).....	35
Table 10 North American Rigid Transparent Acrylics Building and Construction Market, Through 2022 (Million Pounds).....	36
Table 11 Fabrication Methods and Uses of Polystyrene.....	39
Table 12 North American Rigid Transparent Polystyrene Market, by Application, Through 2022 (Million Pounds).....	41
Table 13 North American Rigid Transparent Polystyrene Market in Building and Construction Applications, Through 2022 (Million Pounds).....	42
Table 14 Major SBC Products by Polymer Process.....	43
Table 15 North American Rigid Transparent SBC Market, by Application, Through 2022 (Million Pounds).....	45
Table 16 North American Rigid Transparent SAN Market, by Application, Through 2022 (Million Pounds).....	48
Table 17 North American Rigid Transparent SAN Building and Construction Market, by Product, Through 2022 (Million Pounds).....	49
Table 18 North American Rigid Transparent SMMA Market, by Application, Through 2022 (Million Pounds).....	50
Table 19 North American ABS Rigid Transparent Market, by Application, Through 2022 (Million Pounds).....	53
Table 20 North American Rigid Transparent Cellulosics Plastics Market, by Application, Through 2022 (Million Pounds).....	56
Table 21 Rigid PVC Applications.....	58
Table 22 Leading Global PVC Producers.....	59
Table 23 North American Rigid Transparent PVC Market, by Application, Through 2022 (Million Pounds).....	60
Table 24 North American Market for Thermoplastic Polyester Rigid Transparent Plastics, by Application, Through 2022 (Million Pounds).....	63
Table 25 Global Capacity for Polysulfone Polymer Production.....	65
Table 26 North American Polysulfone Rigid Transparent Plastic Market, by Application, Through 2022* (Million Pounds).....	66
Table 27 U.S. Market Shares of Leading Polypropylene Producers (%).....	70
Table 28 Key Global Nylon Resin Producers.....	72
Table 29 North American Rigid Transparent Plastics Market, by Resin, Through 2022 (Million Pounds).....	74

Table 30 North American Electronics Rigid Transparent Plastics Market, by Resin, Through 2022 (Million Pounds)	79
Table 31 U.S. Housing Starts for Single-Family Homes, 2005-2016 (Thousand Units)	80
Table 32 North American Building and Construction Rigid Transparent Plastic Market, by Resin, Through 2022 (Million Pounds)	81
Table 33 North American Building and Construction Rigid Transparent Plastics Market, by Application, Through 2022 (Million Pounds)	82
Table 34 Selected Properties of Plastic Sheet for Outdoor Applications.....	83
Table 35 North American Glazing Rigid Transparent Plastics Market, by Resin, Through 2022 (Million Pounds)	86
Table 36 North American Lighting Lens Rigid Transparent Plastics Market, by Resin, Through 2022 (Million Pounds).....	94
Table 37 North American Plumbing Fixtures Rigid Transparent Plastics Market, by Resin, Through 2022 (Million Pounds).....	94
Table 38 North American Signs and Displays Rigid Transparent Plastics Market, by Resin, Through 2022 (Million Pounds).....	95
Table 39 Selected Resin Usage by Type of Medical Device	96
Table 40 Radiation Resistance of Key Medical Plastics.....	101
Table 41 Material Property Criteria for Disposable Medical Kits	111
Table 42 Resin Property Criteria for Trays.....	112
Table 43 North American Medical Rigid Transparent Plastics Market, by Resin, Through 2022 (Million Pounds)	113
Table 44 Historical U.S. Light Vehicle Assemblies, 2001-2016 (Million Units).....	114
Table 45 Resin Usage in Automotive Lenses (Percent of Total Volume).....	119
Table 46 North American Automotive Rigid Transparent Plastics Market, by Resin, Through 2022 (Million Pounds).....	120
Table 47 North American Housewares Rigid Transparent Plastics Market, by Resin, Through 2022 (Million Pounds).....	121
Table 48 North American Appliance Rigid Transparent Plastics Market, by Resin, Through 2022 (Million Pounds)	124
Table 49 North American Rigid Transparent Plastic Toy Market, by Resin, Through 2022 (Million Pounds)	127
Table 50 Optical Performance Properties of Selected Rigid Transparent Plastics (%)	133
Table 51 Comparison of Polycarbonates and Trivex Lenses.....	135
Table 52 Selected Contact Lens Materials	138
Table 53 Selected Key Contact Lens Producers and Their Products.....	138
Table 54 MIL-PRF-31013	140
Table 55 North American Optical Lens Transparent Plastic Market, by Resin, Through 2022 (Million Pounds)	141
Table 56 North American Aircraft Rigid Transparent Plastics Market, by Resin, Through 2022 (Million Pounds)	145
Table 57 North American Other Rigid Transparent Plastics Market, by Resin, Through 2022 (Million Pounds)	147
Table 58 North American Rigid Transparent Plastics Market, by Application, Through 2022 (Million Pounds)	148
Table 59 Competitive Transparent Plastics Scenario, by Application.....	152
Table 60 Major Rigid Transparent Plastic Suppliers and Trade-named Products.....	154

List of Figures

Summary Figure: North American Rigid Transparent Plastics Market, by Resin Type, 2016-2022 (Million Pounds) 6



About BCC Research

About BCC Research

With our unparalleled 45-year history, BCC Research provides comprehensive analysis of global market sizing, forecasting and industry intelligence, covering markets where advances in science and technology are improving the quality, standard and sustainability of businesses, economies and lives.

BCC Library Access

From market sizing and forecasts, to opportunity assessments and competitive analyses, our ever-expanding library gives you the data, insights and intelligence required to ensure your project is a success. With myriad options for access to fit all needs and budgets, call 866-285-7215 or email info@bccresearch.com to request a demo.

BCC Custom Research

Our experts provide custom research projects to those working to identify new markets, introduce new products, validate existing market share, analyze competition and assess the potential for products to impact existing markets. With impressive academic credentials and broad and deep knowledge of global industrial markets, our independent analysts and consultants develop the facts, figures, analysis and assessments to inform the decisions that will move your company ahead. Confidential inquiries to: custom@bccresearch.com or 781-205-2429.

DISCLAIMER

The information developed in this report is intended to be as reliable as possible at the time of publication and is of a professional nature. This information does not constitute managerial, legal or accounting advice, nor should it be considered as a corporate policy guide, laboratory manual or an endorsement of any product, as much of the information is speculative in nature. BCC Research and the author assume no responsibility for any loss or damage that might result from reliance on the reported information or from its use.

ISBN: 1-62296-490-X
May 2017