

# **Smart Glass Market by Technology (Electrochromic, Suspended Particle Display, Liquid Crystal, Photochromic, Thermochromic, Micro- blinds), Mechanism (Active, Passive), Control System (Manual, Remote, Mobile-based, Voice-based) - Global Forecast to 2029**

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## **Abstracts**

The global smart glass market is expected to be valued at USD 5.8 billion in 2024 and is projected to reach USD 9.4 billion by 2029; it is expected to grow at a CAGR of 9.8% from 2024 to 2029. The increasing adoption of smart glass in the automotive sector serves as a significant driver for the industry, propelled by various technological advancements and consumer demands. Smart glass, when integrated into automotive applications, offers a range of functionalities that enhance both safety and user experience. One key feature is glare reduction, which improves visibility for drivers, especially during challenging weather conditions. Additionally, smart glass can dynamically adjust tint levels to regulate sunlight, preventing glare and maintaining a comfortable interior temperature. For privacy and security, smart glass can be employed in windows and rearview mirrors, offering instant opacity at the touch of a button. The integration of Heads-Up Display (HUD) technology on smart glass windshields provides essential information directly in the driver's line of sight, minimizing distractions. As the automotive industry moves towards autonomous vehicles, smart glass becomes integral in creating interactive and informative displays within the vehicle. The increasing consumer preference for advanced safety features, coupled with the desire for a more connected and technologically enhanced driving experience, drives the growing adoption of smart glass in the automotive sector, making it a crucial driver for the overall smart glass market.

“Suspended Particle Display (SPD) technology holds second-largest share in the smart glass market”

Suspended Particle Display (SPD) technology holds the second-largest share in the smart glass market owing to its unique ability to dynamically control light transmission. SPD smart glass utilizes suspended particles within a film that can be aligned or dispersed based on an electric field, allowing rapid adjustments in tint levels. This technology offers a balance between the quick responsiveness of electrochromic systems and the simplicity of implementation, contributing to its popularity. Widely used in automotive sunroofs and windows, SPD technology provides users with instant control over glare, visibility, and privacy, making it a preferred choice in applications where real-time adjustments are crucial. The continuous refinement of SPD materials and the versatility of its applications across various sectors position it as a key player in the smart glass market.

“Active mechanism to exhibit highest CAGR in smart glass market”

Active mechanisms exhibit a higher growth rate in the smart glass market due to their dynamic and responsive nature. Active smart glass systems, driven by external stimuli such as electrical voltage or heat, provide instantaneous adjustments in optical properties like tint and transparency. This real-time adaptability is particularly appealing across diverse applications, including smart windows in homes, commercial buildings, and automobiles. The demand for active mechanisms stems from their capability to offer precise control over environmental factors, enhancing user experience by reducing glare, improving privacy, and optimizing energy efficiency. The continual innovation in active smart glass technologies, leading to improved responsiveness, energy efficiency, and cost-effectiveness, positions the active mechanism as a frontrunner in the smart glass market, driving its higher growth rate.

“Architecture end use to exhibit highest growth rate in smart glass market”

Architecture holds a higher growth rate in the smart glass market due to the increasing integration of smart glass solutions in residential and commercial buildings. The architectural sector benefits from the growing emphasis on energy-efficient and technologically advanced structures, where smart glass plays a pivotal role in optimizing natural light, regulating indoor temperatures, and enhancing overall sustainability. Smart glass applications in architecture contribute to a more comfortable and efficient living and working environment, aligning with the rising demand for smart and connected buildings. The adaptability of smart glass to various architectural designs and its ability

to meet evolving consumer preferences for innovative and sustainable construction practices position it as a key driver for the observed higher CAGR in the architectural end-use segment of the smart glass market.

“North America region holds for second-highest share in smart glass market”

North America secures the second-largest share in the smart glass market due to a combination of technological innovation, robust infrastructure, and a high demand for energy-efficient solutions. The region boasts a strong emphasis on sustainability, driving the adoption of smart glass in both commercial and residential construction. The mature automotive industry in North America also contributes significantly, with smart glass applications gaining traction in vehicles for enhanced safety and comfort. The presence of key market players and ongoing investments in research and development further propel North America's growth in the smart glass market. Additionally, supportive government policies and a tech-savvy consumer base contribute to the region's substantial share, marking it as a pivotal player in the global smart glass industry.

The study contains insights from various industry experts, ranging from component suppliers to Tier 1 companies and OEMs. The break-up of the primaries is as follows:

By Company Type: Tier 1 – 26%, Tier 2 – 32%, and Tier 3 – 42%

By Designation: C-level Executives – 40%, Directors – 30%, and Others – 30%

By Region: North America – 35%, Europe – 30%, Asia Pacific – 25%, and RoW – 10%

The key players operating in the smart glass market are Saint-Gobain (France), AGC Inc. (Japan), GENTEX CORPORATION (US), Corning Incorporated (US), Nippon Sheet Glass Co., Ltd (Japan) among others.

Research Coverage:

The research reports the smart glass Market, By Technology (Electrochromic, Suspended Particle Display (SPD), Liquid Crystal (LC)(Polymer Dispersed Liquid Crystal (PDLC) and Twisted Nematic (TN) Liquid Crystals), Photochromic, Thermo-chromic, Micro-blinds and Others), By Mechanism (Active and Passive), By Control System (Manual, Remote, Mobile-based, Voice-based and Others), By End Use

(Architecture (Residential and Commercial), Transportation (Automotive, Aerospace and Marine), Power Generation Plants, and Consumer Electronics & Others) and Region (North America, Europe, Asia Pacific, and Rest of the world (RoW)). The scope of the report covers detailed information regarding the major factors, such as drivers, restraints, challenges, and opportunities, influencing the growth of the smart glass market. A detailed analysis of the key industry players has been done to provide insights into their business overviews, products, key strategies, Contracts, partnerships, and agreements. New product & service launches, mergers and acquisitions, and recent developments associated with the smart glass market. Competitive analysis of upcoming startups in the smart glass market ecosystem is covered in this report.

### Key Benefits of Buying the Report

Analysis of key drivers (Increasing adoption of smart glass in healthcare facilities, Increased demand for smart glass in automotive sector, Increasing integration of electrochromic materials in smart glasses, Improvement in Energy-efficiency with the use of smart glass, Government initiatives to energy-efficient construction projects), restraints (High cost of smart glasses deters large-scale adoption, Technical limitations in functioning of smart glasses, Complex manufacturing processes of smart glasses), opportunities (Higher potential of minimalist architecture in smart glasses for functionality improvement, Increasing need of smart glass technology in solar power generation plants, Expanding applications of smart glasses in automotive, aviation, and marine sectors, Increasing focus on development of sustainable buildings, Growing need of energy-efficient products, Military applications to provide potential growth opportunities in market), and challenges (High initial costs associated with R&D and manufacturing processes, Need of awareness regarding smart glass application across industries, Compliance with building codes and regulations) influencing the growth of the smart glass market.

**Product Development/Innovation:** Detailed insights on upcoming technologies, research & development activities, and new product launches in the smart glass market

**Market Development:** Comprehensive information about lucrative markets – the report analyses the smart glass market across varied regions.

**Market Diversification:** Exhaustive information about new products/services, untapped geographies, recent developments, and investments in the smart

glass market

Competitive Assessment: In-depth assessment of market shares, growth strategies, and service offerings of leading players like Saint-Gobain (France), AGC Inc. (Japan), GENTEX CORPORATION (US), Corning Incorporated (US), Nippon Sheet Glass Co., Ltd (Japan), among others in the smart glass market.

## Contents

### 1 INTRODUCTION

1.1 STUDY OBJECTIVES

1.2 MARKET DEFINITION

1.3 INCLUSIONS AND EXCLUSIONS

1.4 STUDY SCOPE

FIGURE 1 SMART GLASS MARKET SEGMENTATION

1.4.1 REGIONAL SCOPE

1.4.2 YEARS CONSIDERED

1.4.3 CURRENCY CONSIDERED

1.4.4 UNITS CONSIDERED

1.5 LIMITATIONS

1.6 STAKEHOLDERS

1.7 SUMMARY OF CHANGES

1.8 IMPACT OF RECESSION

### 2 RESEARCH METHODOLOGY

2.1 RESEARCH DATA

FIGURE 2 SMART GLASS MARKET: RESEARCH DESIGN

2.1.1 SECONDARY AND PRIMARY RESEARCH

2.1.2 SECONDARY DATA

2.1.2.1 List of major secondary sources

2.1.2.2 Key data from secondary sources

2.1.3 PRIMARY DATA

2.1.3.1 Breakdown of primaries

2.1.3.2 Key data from primary sources

2.1.3.3 Key industry insights

2.1.3.4 List of primary interview participants

2.2 MARKET SIZE ESTIMATION METHODOLOGY

FIGURE 3 SMART GLASS MARKET SIZE ESTIMATION METHODOLOGY

2.2.1 BOTTOM-UP APPROACH

2.2.1.1 Approach to estimate market size using bottom-up analysis (demand side)

FIGURE 4 SMART GLASS MARKET: BOTTOM-UP APPROACH

2.2.2 TOP-DOWN APPROACH

2.2.2.1 Approach to estimate market size using top-down analysis (supply side)

FIGURE 5 SMART GLASS MARKET: TOP-DOWN APPROACH

FIGURE 6 SMART GLASS MARKET: SUPPLY-SIDE ANALYSIS

2.3 MARKET BREAKDOWN AND DATA TRIANGULATION

FIGURE 7 SMART GLASS MARKET: DATA TRIANGULATION

2.4 RESEARCH ASSUMPTIONS

FIGURE 8 SMART GLASS MARKET: RESEARCH ASSUMPTIONS

2.5 RISK ASSESSMENT

TABLE 1 SMART GLASS MARKET: RISK ASSESSMENT

2.6 PARAMETERS CONSIDERED TO ANALYZE RECESSION IMPACT ON SMART GLASS MARKET

TABLE 2 SMART GLASS MARKET: PARAMETERS CONSIDERED TO ANALYZE RECESSION IMPACT ON SMART GLASS MARKET

2.7 RESEARCH LIMITATIONS

FIGURE 9 SMART GLASS MARKET: RESEARCH LIMITATIONS

### **3 EXECUTIVE SUMMARY**

FIGURE 10 ELECTROCHROMIC TECHNOLOGY TO DOMINATE SMART GLASS MARKET DURING FORECAST PERIOD

FIGURE 11 ACTIVE MECHANISM TO ACCOUNT FOR LARGER MARKET SHARE IN 2029

FIGURE 12 MOBILE-BASED CONTROL SYSTEM TO EXHIBIT HIGHEST CAGR FROM 2024 TO 2029

FIGURE 13 TRANSPORTATION SEGMENT TO HOLD LARGEST SHARE OF SMART GLASS MARKET, BY END USE, IN 2024

FIGURE 14 EUROPE HELD LARGEST SHARE OF SMART GLASS MARKET IN 2023

### **4 PREMIUM INSIGHTS**

4.1 ATTRACTIVE OPPORTUNITIES FOR PLAYERS IN SMART GLASS MARKET

FIGURE 15 RISING ADOPTION OF GREEN BUILDING PRACTICES TO CREATE LUCRATIVE OPPORTUNITIES FOR PLAYERS IN SMART GLASS MARKET

4.2 SMART GLASS MARKET IN EUROPE, BY COUNTRY AND TECHNOLOGY

FIGURE 16 UK AND ELECTROCHROMIC TECHNOLOGY TO HOLD LARGEST SHARES OF SMART GLASS MARKET IN EUROPE IN 2024

4.3 SMART GLASS MARKET IN ASIA PACIFIC, BY TECHNOLOGY

FIGURE 17 ELECTROCHROMIC TECHNOLOGY TO ACCOUNT FOR LARGEST SHARE OF SMART GLASS MARKET IN ASIA PACIFIC IN 2029

4.4 SMART GLASS MARKET, BY REGION

FIGURE 18 CHINA TO ACCOUNT FOR HIGHEST CAGR IN SMART GLASS MARKET



DURING FORECAST PERIOD

## 5 MARKET OVERVIEW

### 5.1 INTRODUCTION

### 5.2 MARKET DYNAMICS

FIGURE 19 SMART GLASS MARKET: DRIVERS, RESTRAINTS, OPPORTUNITIES, AND CHALLENGES

#### 5.2.1 DRIVERS

FIGURE 20 IMPACT ANALYSIS: DRIVERS

5.2.1.1 Enforcement of stringent hygiene standards in hospitals

FIGURE 21 SPENDING ON HEALTHCARE CONSTRUCTION PROJECTS IN US

5.2.1.2 Deployment of advanced technologies in luxury cars

FIGURE 22 GLOBAL VEHICLES SALES, 2020–2023

5.2.1.3 Integration of electrochromic materials into smart glasses

FIGURE 23 PRICE OF ELECTROCHROMIC GLASSES

5.2.1.4 Focus on reducing energy consumption of buildings

5.2.1.5 Emphasis on promoting low-carbon economy

#### 5.2.2 RESTRAINTS

FIGURE 24 IMPACT ANALYSIS: RESTRAINTS

5.2.2.1 High initial investment and upfront costs

5.2.2.2 Issues in maintaining precise color transparency

5.2.2.3 Complex manufacturing process

#### 5.2.3 OPPORTUNITIES

FIGURE 25 IMPACT ANALYSIS: OPPORTUNITIES

5.2.3.1 Growing trend of minimalist designs

5.2.3.2 Shifting preference from conventional to renewable energy sources

5.2.3.3 Expanding applications in automotive, aviation, and marine industries

5.2.3.4 Rising development of sustainable buildings

5.2.3.5 Increasing focus on improving window insulation

5.2.3.6 Growing emphasis on enhancing situational awareness of military personnel

#### 5.2.4 CHALLENGES

FIGURE 26 IMPACT ANALYSIS: CHALLENGES

5.2.4.1 High research and development costs

5.2.4.2 Lack of awareness about long-term benefits of smart glass technology

5.2.4.3 Maintaining compliance with building codes and regulations

### 5.3 VALUE CHAIN ANALYSIS

FIGURE 27 SMART GLASS MARKET: VALUE CHAIN ANALYSIS

### 5.4 ECOSYSTEM ANALYSIS



FIGURE 28 SMART GLASS ECOSYSTEM

TABLE 3 ROLE OF COMPANIES IN SMART GLASS ECOSYSTEM

5.5 TRENDS/DISRUPTIONS IMPACTING CUSTOMERS' BUSINESSES

FIGURE 29 SMART GLASS MARKET: TRENDS/DISRUPTIONS IMPACTING CUSTOMERS' BUSINESSES

5.6 PRICING ANALYSIS

5.6.1 AVERAGE SELLING PRICE OF ELECTROCHROMIC SMART GLASSES OFFERED BY THREE KEY PLAYERS

FIGURE 30 AVERAGE SELLING PRICE OF ELECTROCHROMIC SMART GLASSES OFFERED BY THREE KEY PLAYERS

TABLE 4 AVERAGE SELLING PRICE OF ELECTROCHROMIC SMART GLASSES OFFERED BY THREE KEY PLAYERS

5.6.2 AVERAGE SELLING PRICE TREND, BY TECHNOLOGY

FIGURE 31 AVERAGE SELLING PRICE TREND, BY TECHNOLOGY, 2020–2023 (USD PER SQUARE METER)

5.6.3 AVERAGE SELLING PRICE TREND, BY REGION

FIGURE 32 AVERAGE SELLING PRICE OF ELECTROCHROMIC SMART GLASSES, BY REGION, 2020–2023 (USD PER SQUARE METER)

FIGURE 33 AVERAGE SELLING PRICE OF SUSPENDED PARTICLE DISPLAY (SPD) SMART GLASSES, BY REGION, 2020-2023 (USD PER SQUARE METER)

5.7 TECHNOLOGY ANALYSIS

5.7.1 SWITCHABLE PRIVACY GLASSES

5.7.2 INTERACTIVE SMART GLASSES

5.7.3 SELF-TINTING LENSES

5.7.4 ELECTROCHROMIC DEVICES

5.7.5 POLYMER-DISPERSED LIQUID CRYSTALS

5.7.6 SUSPENDED PARTICLE DEVICES

5.7.7 MICRO-BLINDS

5.7.8 NANOCRYSTALS

5.7.9 PHOTOCHROMIC GLASSES

5.7.10 THERMOCHROMIC GLASSES

5.7.11 DIGITAL IMAGES

5.8 PORTER'S FIVE FORCES ANALYSIS

TABLE 5 SMART GLASS MARKET: PORTER'S FIVE FORCES ANALYSIS

FIGURE 34 SMART GLASS MARKET: PORTER'S FIVE FORCES ANALYSIS

5.8.1 INTENSITY OF COMPETITIVE RIVALRY

5.8.2 BARGAINING POWER OF SUPPLIERS

5.8.3 BARGAINING POWER OF BUYERS

5.8.4 THREAT OF NEW ENTRANTS

#### 5.8.5 THREAT OF SUBSTITUTES

### 5.9 KEY STAKEHOLDERS AND BUYING CRITERIA

#### 5.9.1 KEY STAKEHOLDERS IN BUYING PROCESS

FIGURE 35 INFLUENCE OF STAKEHOLDERS ON BUYING PROCESS FOR TOP THREE END USES

TABLE 6 INFLUENCE OF STAKEHOLDERS ON BUYING PROCESS FOR TOP THREE END USES

#### 5.9.2 BUYING CRITERIA

FIGURE 36 KEY BUYING CRITERIA FOR TOP THREE END USES

TABLE 7 KEY BUYING CRITERIA FOR TOP THREE END USES

### 5.10 CASE STUDY ANALYSIS

5.10.1 MANHATTAN-BASED COMPANY IMPLEMENTS FROSTED SMART GLASS TO ADDRESS PRIVACY AND DESIGN CHALLENGES

5.10.2 MITSUBISHI TANABE PHARMA CORPORATION AND SMART GLASS TECHNOLOGIES, LLC COLLABORATE TO ENHANCE OFFICE WORKSPACE

5.10.3 HALTON HEALTHCARE UTILIZES PRIWATT SMART GLASS TO UPGRADE INTENSIVE CARE UNITS AND MAINTAIN PATIENT PRIVACY

5.10.4 GOPUFF ADOPTS PRIWATT SWITCHABLE GLASS TO CREATE MODERN, COLLABORATIVE WORKSPACE

5.10.5 FINANCIAL SERVICES COMPANY SELECTS SAGEGLASS HARMONY SMART WINDOWS TO ACHIEVE OPTIMAL EMPLOYEE COMFORT

### 5.11 TRADE ANALYSIS

#### 5.11.1 IMPORT SCENARIO

FIGURE 37 IMPORT DATA FOR HS CODE 70-COMPLIANT GLASSES AND GLASSWARE, BY KEY COUNTRY, 2018–2022 (USD MILLION)

#### 5.11.2 EXPORT SCENARIO

FIGURE 38 EXPORT DATA FOR HS CODE 70-COMPLIANT GLASSES AND GLASSWARE, BY KEY COUNTRY, 2018–2022 (USD MILLION)

### 5.12 TARIFFS, REGULATORY LANDSCAPE, AND STANDARDS

#### 5.12.1 COUNTRY-WISE TARIFF FOR HS CODE 70-COMPLIANT PRODUCTS

TABLE 8 MFN TARIFF FOR HS CODE 70-COMPLIANT PRODUCTS EXPORTED BY CHINA

TABLE 9 MFN TARIFF HS CODE 70-COMPLIANT PRODUCTS EXPORTED BY GERMANY

5.12.2 REGULATORY BODIES, GOVERNMENT AGENCIES, AND OTHER ORGANIZATIONS

TABLE 10 NORTH AMERICA: LIST OF REGULATORY BODIES, GOVERNMENT AGENCIES, AND OTHER ORGANIZATIONS

TABLE 11 EUROPE: LIST OF REGULATORY BODIES, GOVERNMENT AGENCIES,

## AND OTHER ORGANIZATIONS

TABLE 12 ASIA PACIFIC: LIST OF REGULATORY BODIES, GOVERNMENT AGENCIES, AND OTHER ORGANIZATIONS

TABLE 13 ROW: LIST OF REGULATORY BODIES, GOVERNMENT AGENCIES, AND OTHER ORGANIZATIONS

### 5.12.3 REGULATIONS

5.12.3.1 North America

5.12.3.2 Europe

5.12.3.3 Global

### 5.12.4 STANDARDS

## 5.13 PATENT ANALYSIS

FIGURE 39 SMART GLASS MARKET: PATENTS APPLIED AND GRANTED, 2013–2022

TABLE 14 SMART GLASS MARKET: LIST OF PATENTS, 2020–2023

### 5.14 KEY CONFERENCES AND EVENTS, 2024–2025

TABLE 15 SMART GLASS MARKET: LIST OF KEY CONFERENCES AND EVENTS, 2024–2025

## 6 SMART GLASS MARKET, BY TECHNOLOGY

### 6.1 INTRODUCTION

FIGURE 40 SUSPENDED PARTICLE DISPLAY (SPD) TECHNOLOGY TO EXHIBIT HIGHEST CAGR DURING FORECAST PERIOD

TABLE 16 SMART GLASS MARKET, BY TECHNOLOGY, 2020–2023 (USD MILLION)

TABLE 17 SMART GLASS MARKET, BY TECHNOLOGY, 2024–2029 (USD MILLION)

TABLE 18 SMART GLASS MARKET, BY TECHNOLOGY, 2020–2023 (THOUSAND SQUARE METER)

TABLE 19 SMART GLASS MARKET, BY TECHNOLOGY, 2024–2029 (THOUSAND SQUARE METER)

### 6.2 ELECTROCHROMIC

6.2.1 DEPLOYMENT OF ELECTROCHROMIC TECHNOLOGY AS ECO-FRIENDLY SOLUTION FOR DYNAMIC GLASS TRANSITION TO DRIVE MARKET

TABLE 20 ELECTROCHROMIC: SMART GLASS MARKET, BY END USE, 2020–2023 (USD MILLION)

TABLE 21 ELECTROCHROMIC: SMART GLASS MARKET, BY END USE, 2024–2029 (USD MILLION)

TABLE 22 ELECTROCHROMIC: SMART GLASS MARKET, BY REGION, 2020–2023 (USD MILLION)

TABLE 23 ELECTROCHROMIC: SMART GLASS MARKET, BY REGION, 2024–2029

(USD MILLION)

### 6.3 SUSPENDED PARTICLE DISPLAY (SPD)

#### 6.3.1 MINIMAL ENERGY CONSUMPTION TO ACCELERATE USE OF SPD SMART GLASSES

TABLE 24 SUSPENDED PARTICLE DISPLAY (SPD): SMART GLASS MARKET, BY END USE, 2020–2023 (USD MILLION)

TABLE 25 SUSPENDED PARTICLE DISPLAY (SPD): SMART GLASS MARKET, BY END USE, 2024–2029 (USD MILLION)

TABLE 26 SUSPENDED PARTICLE DISPLAY (SPD): SMART GLASS MARKET, BY REGION, 2020–2023 (USD MILLION)

TABLE 27 SUSPENDED PARTICLE DISPLAY (SPD): SMART GLASS MARKET, BY REGION, 2024–2029 (USD MILLION)

### 6.4 LIQUID CRYSTAL (LC)

TABLE 28 LIQUID CRYSTAL (LC): SMART GLASS MARKET, BY END USE, 2020–2023 (USD MILLION)

TABLE 29 LIQUID CRYSTAL (LC): SMART GLASS MARKET, BY END USE, 2024–2029 (USD MILLION)

TABLE 30 LIQUID CRYSTAL (LC): SMART GLASS MARKET, BY REGION, 2020–2023 (USD MILLION)

TABLE 31 LIQUID CRYSTAL (LC): SMART GLASS MARKET, BY REGION, 2024–2029 (USD MILLION)

TABLE 32 LIQUID CRYSTAL (LC): SMART GLASS MARKET, BY TYPE, 2020–2023 (USD MILLION)

TABLE 33 LIQUID CRYSTAL (LC): SMART GLASS MARKET, BY TYPE, 2024–2029 (USD MILLION)

#### 6.4.1 POLYMER DISPERSED LIQUID CRYSTALS (PDLCS)

6.4.1.1 Growing demand for privacy and dynamic light control solutions to boost segmental growth

#### 6.4.2 TWISTED NEMATIC (TN) LIQUID CRYSTALS

6.4.2.1 Increasing need for quick switching features in home automation solutions to augment segmental growth

### 6.5 PHOTOCROMIC

#### 6.5.1 DYNAMIC LIGHT-RESPONSIVE CAPABILITIES TO FUEL ADOPTION OF PHOTOCROMIC GLASSES

TABLE 34 PHOTOCROMIC: SMART GLASS MARKET, BY END USE, 2020–2023 (USD MILLION)

TABLE 35 PHOTOCROMIC: SMART GLASS MARKET, BY END USE, 2024–2029 (USD MILLION)

TABLE 36 PHOTOCROMIC: SMART GLASS MARKET, BY REGION, 2020–2023

(USD MILLION)

TABLE 37 PHOTOCROMIC: SMART GLASS MARKET, BY REGION, 2024–2029

(USD MILLION)

#### 6.6 THERMOCHROMIC

6.6.1 CAPABILITY OF THERMOCHROMIC LAYERS TO REDUCE GLARE AND NOISE LEVELS TO DRIVE MARKET

TABLE 38 THERMOCHROMIC: SMART GLASS MARKET, BY END USE, 2020–2023  
(USD THOUSAND)

TABLE 39 THERMOCHROMIC: SMART GLASS MARKET, BY END USE, 2024–2029  
(USD THOUSAND)

TABLE 40 THERMOCHROMIC: SMART GLASS MARKET, BY REGION, 2020–2023  
(USD MILLION)

TABLE 41 THERMOCHROMIC: SMART GLASS MARKET, BY REGION, 2024–2029  
(USD MILLION)

#### 6.7 MICRO-BLINDS

6.7.1 HIGH SWITCHING SPEED AND UV DURABILITY TO AUGMENT DEMAND FOR MICRO-BLIND SMART GLASSES

TABLE 42 MICRO-BLINDS: SMART GLASS MARKET, BY END USE, 2020–2023  
(USD MILLION)

TABLE 43 MICRO-BLINDS: SMART GLASS MARKET, BY END USE, 2024–2029  
(USD MILLION)

TABLE 44 MICRO-BLINDS: SMART GLASS MARKET, BY REGION, 2020–2023 (USD THOUSAND)

TABLE 45 MICRO-BLINDS: SMART GLASS MARKET, BY REGION, 2024–2029 (USD THOUSAND)

#### 6.8 OTHER TECHNOLOGIES

TABLE 46 OTHER TECHNOLOGIES: SMART GLASS MARKET, BY END USE, 2020–2023 (USD MILLION)

TABLE 47 OTHER TECHNOLOGIES: SMART GLASS MARKET, BY END USE, 2024–2029 (USD MILLION)

TABLE 48 OTHER TECHNOLOGIES: SMART GLASS MARKET, BY REGION, 2020–2023 (USD MILLION)

TABLE 49 OTHER TECHNOLOGIES: SMART GLASS MARKET, BY REGION, 2024–2029 (USD MILLION)

## 7 SMART GLASS MARKET, BY MECHANISM

### 7.1 INTRODUCTION

FIGURE 41 ACTIVE MECHANISM TO EXHIBIT HIGHER CAGR IN SMART GLASS

*Smart Glass Market by Technology (Electrochromic, Suspended Particle Display, Liquid Crystal, Photochromic, Th...*

MARKET BETWEEN 2024 AND 2029

TABLE 50 SMART GLASS MARKET, BY MECHANISM, 2020–2023 (USD MILLION)

TABLE 51 SMART GLASS MARKET, BY MECHANISM, 2024–2029 (USD MILLION)

7.2 ACTIVE

7.2.1 GROWING DEMAND FOR CUSTOMIZABLE AND USER-FRIENDLY SMART GLASSES TO FUEL SEGMENTAL GROWTH

7.3 PASSIVE

7.3.1 RISING PREFERENCE FOR SUSTAINABLE BUILDING SOLUTIONS TO PROPEL MARKET

## **8 SMART GLASS MARKET, BY CONTROL SYSTEM**

8.1 INTRODUCTION

FIGURE 42 MANUAL CONTROL SYSTEMS TO DOMINATE SMART GLASS MARKET DURING FORECAST PERIOD

TABLE 52 SMART GLASS MARKET, BY CONTROL SYSTEM, 2020–2023 (USD MILLION)

TABLE 53 SMART GLASS MARKET, BY CONTROL SYSTEM, 2024–2029 (USD MILLION)

8.2 MANUAL

8.2.1 SIMPLICITY AND COST-EFFECTIVENESS OF MANUAL CONTROL SYSTEMS TO ACCELERATE SEGMENTAL GROWTH

8.3 REMOTE

8.3.1 PREFERENCE FOR CONVENIENT MEANS OF SMART GLASS INSTALLATION TO FOSTER SEGMENTAL GROWTH

8.4 MOBILE-BASED

8.4.1 INCREASED ADOPTION OF IOT-CONNECTED DEVICES TO FUEL SEGMENTAL GROWTH

8.5 VOICE-BASED

8.5.1 HIGH ACCESSIBILITY AND USER EXPERIENCE ATTRIBUTES TO BOOST ADOPTION OF VOICE-BASED SMART GLASS CONTROL SYSTEMS

8.6 OTHER CONTROL SYSTEMS

## **9 SMART GLASS MARKET, BY END USE**

9.1 INTRODUCTION

FIGURE 43 TRANSPORTATION SEGMENT TO DOMINATE SMART GLASS MARKET DURING FORECAST PERIOD

TABLE 54 SMART GLASS MARKET, BY END USE, 2020–2023 (USD MILLION)



**TABLE 55 SMART GLASS MARKET, BY END USE, 2024–2029 (USD MILLION)****9.2 ARCHITECTURE****TABLE 56 ARCHITECTURE: SMART GLASS MARKET, BY TECHNOLOGY, 2020–2023 (USD MILLION)****TABLE 57 ARCHITECTURE: SMART GLASS MARKET, BY TECHNOLOGY, 2024–2029 (USD MILLION)****TABLE 58 ARCHITECTURE: SMART GLASS MARKET, BY APPLICATION, 2020–2023 (USD MILLION)****TABLE 59 ARCHITECTURE: SMART GLASS MARKET, BY APPLICATION, 2024–2029 (USD MILLION)****9.2.1 RESIDENTIAL****9.2.1.1 Increasing emphasis on smart and energy-efficient buildings to drive market****9.2.2 COMMERCIAL****9.2.2.1 Growing deployment of smart glasses integrated with adaptive lighting technology in educational institutes to foster segmental growth****9.3 TRANSPORTATION****TABLE 60 TRANSPORTATION: SMART GLASS MARKET, BY TECHNOLOGY, 2020–2023 (USD MILLION)****TABLE 61 TRANSPORTATION: SMART GLASS MARKET, BY TECHNOLOGY, 2024–2029 (USD MILLION)****TABLE 62 TRANSPORTATION: SMART GLASS MARKET, BY APPLICATION, 2020–2023 (USD MILLION)****TABLE 63 TRANSPORTATION: SMART GLASS MARKET, BY APPLICATION, 2024–2029 (USD MILLION)****9.3.1 AUTOMOTIVE****9.3.1.1 Rising use of advanced technology to improve driving experience to accelerate segmental growth****9.3.2 AEROSPACE****9.3.2.1 Increasing need for enhanced privacy and lighting control in aircraft to fuel segmental growth****9.3.3 MARINE****9.3.3.1 Surging deployment of customizable shading solutions in luxurious marine vehicles to foster segmental growth****9.4 POWER GENERATION PLANTS****9.4.1 ADOPTION OF PHOTOCROMIC GLASSES TO GENERATE SOLAR POWER TO FACILITATE MARKET GROWTH****TABLE 64 POWER GENERATION PLANTS: SMART GLASS MARKET, BY TECHNOLOGY, 2020–2023 (USD MILLION)****TABLE 65 POWER GENERATION PLANTS: SMART GLASS MARKET, BY**



TECHNOLOGY, 2024–2029 (USD MILLION)

9.5 CONSUMER ELECTRONICS & OTHERS

9.5.1 USE OF ANTIREFLECTION SMART GLASSES TO ENHANCE QUALITY OF CONSUMER ELECTRONICS TO BOOST SEGMENTAL GROWTH

TABLE 66 CONSUMER ELECTRONICS & OTHERS: SMART GLASS MARKET, BY TECHNOLOGY, 2020–2023 (USD THOUSAND)

TABLE 67 CONSUMER ELECTRONICS & OTHERS: SMART GLASS MARKET, BY TECHNOLOGY, 2024–2029 (USD THOUSAND)

## **10 SMART GLASS MARKET, BY REGION**

10.1 INTRODUCTION

FIGURE 44 SMART GLASS MARKET IN ASIA PACIFIC TO REGISTER HIGHEST CAGR FROM 2024 TO 2029

TABLE 68 SMART GLASS MARKET, BY REGION, 2020–2023 (USD MILLION)

TABLE 69 SMART GLASS MARKET, BY REGION, 2024–2029 (USD MILLION)

10.2 NORTH AMERICA

FIGURE 45 NORTH AMERICA: SMART GLASS MARKET SNAPSHOT

TABLE 70 NORTH AMERICA: SMART GLASS MARKET, BY COUNTRY, 2020–2023 (USD MILLION)

TABLE 71 NORTH AMERICA: SMART GLASS MARKET, BY COUNTRY, 2024–2029 (USD MILLION)

TABLE 72 NORTH AMERICA: SMART GLASS MARKET, BY TECHNOLOGY, 2020–2023 (USD MILLION)

TABLE 73 NORTH AMERICA: SMART GLASS MARKET, BY TECHNOLOGY, 2024–2029 (USD MILLION)

10.2.1 US

10.2.1.1 Integration of smart glasses into building infrastructure to reduce energy consumption to support market growth

TABLE 74 US: SMART GLASS MARKET, BY END USE, 2020–2023 (USD MILLION)

TABLE 75 US: SMART GLASS MARKET, BY END USE, 2024–2029 (USD MILLION)

10.2.2 CANADA

10.2.2.1 Enforcement of stringent regulations to promote energy efficiency to drive market

TABLE 76 CANADA: SMART GLASS MARKET, BY END USE, 2020–2023 (USD MILLION)

TABLE 77 CANADA: SMART GLASS MARKET, BY END USE, 2024–2029 (USD MILLION)

10.2.3 MEXICO

10.2.3.1 Expansion of tourism and hospitality sector to contribute to market growth

TABLE 78 MEXICO: SMART GLASS MARKET, BY END USE, 2020–2023 (USD MILLION)

TABLE 79 MEXICO: SMART GLASS MARKET, BY END USE, 2024–2029 (USD MILLION)

10.2.4 RECESSION IMPACT ON MARKET IN NORTH AMERICA

10.3 EUROPE

FIGURE 46 EUROPE: SMART GLASS MARKET SNAPSHOT

TABLE 80 EUROPE: SMART GLASS MARKET, BY COUNTRY, 2020–2023 (USD MILLION)

TABLE 81 EUROPE: SMART GLASS MARKET, BY COUNTRY, 2024–2029 (USD MILLION)

TABLE 82 EUROPE: SMART GLASS MARKET, BY TECHNOLOGY, 2020–2023 (USD MILLION)

TABLE 83 EUROPE: SMART GLASS MARKET, BY TECHNOLOGY, 2024–2029 (USD MILLION)

10.3.1 UK

10.3.1.1 Rising installation of smart glasses in healthcare facilities to improve patient privacy and comfort to foster market growth

TABLE 84 UK: SMART GLASS MARKET, BY END USE, 2020–2023 (USD MILLION)

TABLE 85 UK: SMART GLASS MARKET, BY END USE, 2024–2029 (USD MILLION)

10.3.2 GERMANY

10.3.2.1 Increasing investment in advanced automotive technologies to fuel market growth

TABLE 86 GERMANY: SMART GLASS MARKET, BY END USE, 2020–2023 (USD MILLION)

TABLE 87 GERMANY: SMART GLASS MARKET, BY END USE, 2024–2029 (USD MILLION)

10.3.3 FRANCE

10.3.3.1 Growing preference for energy-efficient buildings to propel market

TABLE 88 FRANCE: SMART GLASS MARKET, BY END USE, 2020–2023 (USD MILLION)

TABLE 89 FRANCE: SMART GLASS MARKET, BY END USE, 2024–2029 (USD MILLION)

10.3.4 ITALY

10.3.4.1 Surging adoption of sustainable building practices to boost market growth

TABLE 90 ITALY: SMART GLASS MARKET, BY END USE, 2020–2023 (USD MILLION)

TABLE 91 ITALY: SMART GLASS MARKET, BY END USE, 2024–2029 (USD MILLION)

MILLION)

#### 10.3.5 REST OF EUROPE

TABLE 92 REST OF EUROPE: SMART GLASS MARKET, BY END USE, 2020–2023  
(USD THOUSAND)

TABLE 93 REST OF EUROPE: SMART GLASS MARKET, BY END USE, 2024–2029  
(USD THOUSAND)

#### 10.3.6 RECESSION IMPACT ON MARKET IN EUROPE

### 10.4 ASIA PACIFIC

FIGURE 47 ASIA PACIFIC: SMART GLASS MARKET SNAPSHOT

TABLE 94 ASIA PACIFIC: SMART GLASS MARKET, BY COUNTRY, 2020–2023 (USD  
MILLION)

TABLE 95 ASIA PACIFIC: SMART GLASS MARKET, BY COUNTRY, 2024–2029 (USD  
MILLION)

TABLE 96 ASIA PACIFIC: SMART GLASS MARKET, BY TECHNOLOGY, 2020–2023  
(USD MILLION)

TABLE 97 ASIA PACIFIC: SMART GLASS MARKET, BY TECHNOLOGY, 2024–2029  
(USD MILLION)

#### 10.4.1 CHINA

10.4.1.1 Rising adoption of sustainable industrial practices to augment market growth

TABLE 98 CHINA: SMART GLASS MARKET, BY END USE, 2020–2023 (USD  
MILLION)

TABLE 99 CHINA: SMART GLASS MARKET, BY END USE, 2024–2029 (USD  
MILLION)

#### 10.4.2 JAPAN

10.4.2.1 Increasing implementation of vehicle emission norms to foster market growth

TABLE 100 JAPAN: SMART GLASS MARKET, BY END USE, 2020–2023 (USD  
MILLION)

TABLE 101 JAPAN: SMART GLASS MARKET, BY END USE, 2024–2029 (USD  
MILLION)

#### 10.4.3 SOUTH KOREA

10.4.3.1 Escalating adoption of advanced technologies in consumer electronics to  
accelerate market growth

TABLE 102 SOUTH KOREA: SMART GLASS MARKET, BY END USE, 2020–2023  
(USD MILLION)

TABLE 103 SOUTH KOREA: SMART GLASS MARKET, BY END USE, 2024–2029  
(USD MILLION)

#### 10.4.4 INDIA

10.4.4.1 Increasing railway infrastructure developments to boost market growth

TABLE 104 INDIA: SMART GLASS MARKET, BY END USE, 2020–2023 (USD

THOUSAND)

TABLE 105 INDIA: SMART GLASS MARKET, BY END USE, 2024–2029 (USD THOUSAND)

10.4.5 REST OF ASIA PACIFIC

TABLE 106 REST OF ASIA PACIFIC: SMART GLASS MARKET, BY END USE, 2020–2023 (USD THOUSAND)

TABLE 107 REST OF ASIA PACIFIC: SMART GLASS MARKET, BY END USE, 2024–2029 (USD THOUSAND)

10.4.6 RECESSION IMPACT ON MARKET IN ASIA PACIFIC

10.5 ROW

TABLE 108 ROW: SMART GLASS MARKET, BY REGION, 2020–2023 (USD MILLION)

TABLE 109 ROW: SMART GLASS MARKET, BY REGION, 2024–2029 (USD MILLION)

TABLE 110 ROW: SMART GLASS MARKET, BY TECHNOLOGY, 2020–2023 (USD THOUSAND)

TABLE 111 ROW: SMART GLASS MARKET, BY TECHNOLOGY, 2024–2029 (USD THOUSAND)

10.5.1 SOUTH AMERICA

10.5.1.1 Adoption of advanced construction technologies to propel market

TABLE 112 SOUTH AMERICA: SMART GLASS MARKET, BY END USE, 2020–2023 (USD MILLION)

TABLE 113 SOUTH AMERICA: SMART GLASS MARKET, BY END USE, 2024–2029 (USD MILLION)

10.5.2 MIDDLE EAST & AFRICA

10.5.2.1 Warm and dry climatic conditions to augment use of smart glasses in building architecture applications

TABLE 114 MIDDLE EAST & AFRICA: SMART GLASS MARKET, BY END USE, 2020–2023 (USD MILLION)

TABLE 115 MIDDLE EAST & AFRICA: SMART GLASS MARKET, BY END USE, 2024–2029 (USD MILLION)

10.5.3 RECESSION IMPACT ON MARKET IN ROW

## **11 COMPETITIVE LANDSCAPE**

11.1 OVERVIEW

11.2 OVERVIEW OF STRATEGIES ADOPTED BY KEY PLAYERS, 2020–2023

TABLE 116 SMART GLASS MARKET: STRATEGIES ADOPTED BY KEY PLAYERS, 2020–2023

11.2.1 PRODUCT/SERVICE PORTFOLIO EXPANSION

11.2.2 REGIONAL FOOTPRINT EXPANSION

- 11.2.3 ORGANIC/INORGANIC GROWTH
- 11.3 MARKET SHARE ANALYSIS, 2023
  - FIGURE 48 SMART GLASS MARKET SHARE ANALYSIS, 2023
  - TABLE 117 SMART GLASS MARKET SHARE ANALYSIS, 2023
- 11.4 REVENUE ANALYSIS, 2018–2022
  - FIGURE 49 REVENUE ANALYSIS OF TOP FIVE PLAYERS, 2018–2022
- 11.5 COMPANY EVALUATION MATRIX, 2023
  - 11.5.1 STARS
  - 11.5.2 EMERGING LEADERS
  - 11.5.3 PERVASIVE PLAYERS
  - 11.5.4 PARTICIPANTS
    - FIGURE 50 SMART GLASS MARKET: COMPANY EVALUATION MATRIX, 2023
  - 11.5.5 COMPANY FOOTPRINT
    - TABLE 118 COMPANY TECHNOLOGY FOOTPRINT (25 KEY PLAYERS)
    - TABLE 119 COMPANY END USE FOOTPRINT (25 KEY PLAYERS)
    - TABLE 120 COMPANY REGION FOOTPRINT (25 KEY PLAYERS)
    - TABLE 121 OVERALL COMPANY FOOTPRINT (25 KEY PLAYERS)
- 11.6 START-UP/SME EVALUATION MATRIX, 2023
  - 11.6.1 PROGRESSIVE COMPANIES
  - 11.6.2 RESPONSIVE COMPANIES
  - 11.6.3 DYNAMIC COMPANIES
  - 11.6.4 STARTING BLOCKS
    - FIGURE 51 SMART GLASS MARKET: START-UP/SME EVALUATION MATRIX, 2023
  - 11.6.5 COMPETITIVE BENCHMARKING
    - TABLE 122 SMART GLASS MARKET: LIST OF KEY START-UPS/SMES
    - TABLE 123 COMPANY TECHNOLOGY FOOTPRINT (9 START-UPS/SMES)
    - TABLE 124 COMPANY END USE FOOTPRINT (9 START-UPS/SMES)
    - TABLE 125 COMPANY REGION FOOTPRINT (9 START-UPS/SMES)
- 11.7 COMPETITIVE SCENARIOS AND TRENDS
  - 11.7.1 PRODUCT LAUNCHES
    - TABLE 126 SMART GLASS MARKET: PRODUCT LAUNCHES, JULY 2020–DECEMBER 2022
  - 11.7.2 DEALS
    - TABLE 127 SMART GLASS MARKET: DEALS, JANUARY 2021–OCTOBER 2023

## **12 COMPANY PROFILES**

(Business Overview, Products Offered, Recent Developments, MnM View Right to win, Strategic choices made, Weaknesses and competitive threats) \*

## 12.1 KEY PLAYERS

### 12.1.1 SAINT-GOBAIN

TABLE 128 SAINT-GOBAIN: COMPANY OVERVIEW

FIGURE 52 SAINT-GOBAIN: COMPANY SNAPSHOT

TABLE 129 SAINT-GOBAIN: PRODUCTS/SERVICES/SOLUTIONS OFFERED

TABLE 130 SAINT-GOBAIN: DEALS

### 12.1.2 AGC INC.

TABLE 131 AGC INC.: COMPANY OVERVIEW

FIGURE 53 AGC INC.: COMPANY SNAPSHOT

TABLE 132 AGC INC.: PRODUCTS/SERVICES/SOLUTIONS OFFERED

TABLE 133 AGC INC.: PRODUCT LAUNCHES

TABLE 134 AGC INC.: DEALS

### 12.1.3 GENTEX CORPORATION

TABLE 135 GENTEX CORPORATION: COMPANY OVERVIEW

FIGURE 54 GENTEX CORPORATION: COMPANY SNAPSHOT

TABLE 136 GENTEX CORPORATION: PRODUCTS/SERVICES/SOLUTIONS OFFERED

TABLE 137 GENTEX CORPORATION: DEALS

### 12.1.4 CORNING INCORPORATED

TABLE 138 CORNING INCORPORATED: COMPANY OVERVIEW

FIGURE 55 CORNING INCORPORATED: COMPANY SNAPSHOT

TABLE 139 CORNING INCORPORATED: PRODUCTS/SERVICES/SOLUTIONS OFFERED

TABLE 140 CORNING INCORPORATED: PRODUCT LAUNCHES

TABLE 141 CORNING INCORPORATED: DEALS

### 12.1.5 NIPPON SHEET GLASS CO., LTD

TABLE 142 NIPPON SHEET GLASS CO., LTD: COMPANY OVERVIEW

FIGURE 56 NIPPON SHEET GLASS CO., LTD: COMPANY SNAPSHOT

TABLE 143 NIPPON SHEET GLASS CO., LTD: PRODUCTS/SERVICES/SOLUTIONS OFFERED

TABLE 144 NIPPON SHEET GLASS CO., LTD: PRODUCT LAUNCHES

TABLE 145 NIPPON SHEET GLASS CO., LTD: DEALS

### 12.1.6 VIEW, INC.

TABLE 146 VIEW, INC.: COMPANY OVERVIEW

FIGURE 57 VIEW, INC.: COMPANY SNAPSHOT

TABLE 147 VIEW, INC.: PRODUCTS/SERVICES/SOLUTIONS OFFERED

TABLE 148 VIEW, INC.: DEALS

### 12.1.7 XINYI GLASS HOLDINGS LIMITED

TABLE 149 XINYI GLASS HOLDINGS LIMITED: COMPANY OVERVIEW

FIGURE 58 XINYI GLASS HOLDINGS LIMITED: COMPANY SNAPSHOT  
TABLE 150 XINYI GLASS HOLDINGS LIMITED: PRODUCTS/SERVICES/SOLUTIONS OFFERED

12.1.8 GAUZY LTD

TABLE 151 GAUZY LTD: COMPANY OVERVIEW

TABLE 152 GAUZY LTD: PRODUCTS/SERVICES/SOLUTIONS OFFERED

TABLE 153 GAUZY LTD: DEALS

12.1.9 RESEARCH FRONTIERS INC.

TABLE 154 RESEARCH FRONTIERS INC.: COMPANY OVERVIEW

FIGURE 59 RESEARCH FRONTIERS INC.: COMPANY SNAPSHOT

TABLE 155 RESEARCH FRONTIERS INC.: PRODUCTS/SERVICES/SOLUTIONS OFFERED

TABLE 156 RESEARCH FRONTIERS INC.: PRODUCT LAUNCHES

12.1.10 DIAMOND SWITCHABLE GLASS LTD

TABLE 157 DIAMOND SWITCHABLE GLASS LTD: COMPANY OVERVIEW

TABLE 158 DIAMOND SWITCHABLE GLASS LTD:

PRODUCTS/SERVICES/SOLUTIONS OFFERED

12.2 OTHER COMPANIES

12.2.1 PLEOTINT LLC

12.2.2 TAIWAN GLASS IND. CORP.

12.2.3 FUYAO GLASS INDUSTRY GROUP CO., LTD.

12.2.4 CENTRAL GLASS CO., LTD.

12.2.5 CHROMOGENICS

12.2.6 RAVENWINDOW

12.2.7 POLYTRONIX, INC.

12.2.8 PGW AUTO GLASS, LLC

12.2.9 AGP GROUP

12.2.10 SPD CONTROL SYSTEMS CORPORATION

12.2.11 SCIENSTRY, INC.

12.2.12 INNOVATIVE GLASS CORPORATION

12.2.13 HALIO, INC.

12.2.14 MIRU SMART TECHNOLOGIES

12.2.15 MERCK KGAA

\*Details on Business Overview, Products Offered, Recent Developments, MnM View, Right to win, Strategic choices made, Weaknesses and competitive threats might not be captured in case of unlisted companies.

## 13 APPENDIX



13.1 INSIGHTS FROM INDUSTRY EXPERTS

13.2 DISCUSSION GUIDE

13.3 KNOWLEDGESTORE: MARKETSANDMARKETS' SUBSCRIPTION PORTAL

13.4 CUSTOMIZATION OPTIONS

13.5 RELATED REPORTS

13.6 AUTHOR DETAILS

## About

Smart glass is also known by switchable glass, dimmable glass or dynamic glass. It is a kind of glass which changes its light transmission properties according to the provided stimulus. Based on whether, they require an electrical stimulus to respond or the level of control it offers to users; it can be categorized into Active or Passive. Electrochromic, SPD, and Liquid crystal are some of the active smart glass technologies which respond to voltage as a stimulus and adjust the light transmission property dynamically. On the other hand, Passive smart glass technologies such as Thermo-chromic and Photochromic react naturally to heat or light.

Smart glass technologies covered in this report are: Thermo-chromic, Suspended particle device (SPD), Electrochromic (EC), Liquid crystal (LC)/ Polymer dispersed liquid crystal (PDLC), Photochromic and so on. Also technical assessment of the latest, emerging smart glass technologies- micro blinds and nanocrystals are also provided. Out of all the traditional smart glass technologies, Electrochromic is being recognized as one of the promising ones, owing to the highest dynamic control, as it allows light and heat through the glass. With its unique properties such as durability and fastest switching times, Electrochromic smart glass is expected to revolutionize the architectural application segment occupying the major chunk of market revenue by 2020.

Transportation sector is another growth market for this product. In automotive segment, smart glass is becoming a popular choice for rear view mirrors and sunroofs because of the value it brings in the form of controlling the glare, tinting and so on. Reputed automobile players such as Daimler AG (Germany) and BMW AG (Germany) have used smart glass for windows and sun-roofs, in their premium cars such as Mercedes-Benz SLK and BMW Active Tourer respectively. Also aviation players such as Boeing Company (U.S.) used smart windows in its 787 Dreamliner aircraft. In order to further analyze the integration of smart windows in Boeing's 787 Dreamliner, a case study based on the same is included in this report.

The report covers smart glass market by its applications, technology, size and geography. The detailed segmentation by commercial architectural applications included in the report covers educational buildings, corporate buildings, hospitals & lab facilities and retail applications of smart glass. While automotive segment takes into account smart glass products such as windows, doors, windshields and rear view mirrors.

It provides thorough analysis of the present market scenario and its projection till 2020. The report also captures the market roadmap with market size estimates, revenue forecasts, value chain, competitive landscape, leading players, and their key developments, strategies, and profile. Whereas, the geographical segmentation section gives the smart glass market for various geographical regions namely: North America, Europe, APAC, RoW and Latin America. Besides segmentation, this report encapsulates the major driving factors for smart glass market such as encouraging government legislations and policies, green building initiatives and so on.

This report also profiles key industry player of smart glass market. The detailed analysis about their strategies and developments is included in the report. These key industry players are - Asahi Glass Company (Japan), Citala Pvt. Ltd (Israel), Corning Inc (U.S.), DuPont (U.S.), Gentex Corporation (U.S.), Hitachi Chemicals (Japan), PPG Industries (U.S.), Pleotint (U.S.), Ravenbrick LLC (U.S.), Research Frontier (U.S.), Smartglass international (Ireland), SageElectrochromics (U.S.), Saint Gobain (France), Scienstry (U.S.), SPD smartglass (U.S.) and View Inc (U.S.).

This report primarily encompasses the smart glass market used in various applications. These applications are segmented in form of sectors such as architectural, transportation, solar power generation plant, electronics and others. The use of smart glass products are explained in these sectors. In addition, technologies of smart glass such as Electrochromic, SPD, Liquid crystals, Thermochromic and so on are explained in this report. Contributions of various geographies in smart glass market are analyzed and explained in geographical analysis of the report. Geographies covered in this report are Americas, Europe, APAC and ROW. Each section provides market data, trends and opportunities, key players, and competitive outlook. It also provides market tables for covering the sub-segments. In addition, the report provides 15 extensive company profiles covering all the sub-segments.

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