GLASS

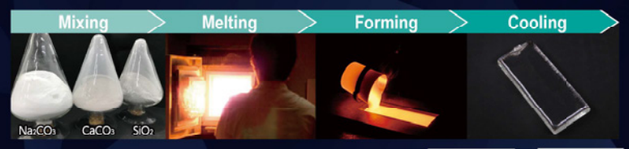
THE MOST UNIVERSAL MODERN MATERIAL

Glass has transformed the development of modern civilization in more ways than you may realize.

Glass and Our Daily Lives

Glass materials impact every major industry of modern civilization and scientific discovery, including developments of medical and space sciences, the internet, and computers. Our lives would be very different if there were no materials made of glass.

How Glass is Formed



To form a glass, minerals (sand) are mixed and heated to high temperatures to form a sludge-like melt. Upon fast cooling, the mixture solidifies but the atoms remain in a disordered liquid arrangement. The lack of long range atomic order (called non-crystalline) is characteristic of the glassy state.

Crystalline Order Glassy Disorder

Let's see how glass is made!

Art & Culture

Anti-Reflective Coating

Without Coating With Coating

Vivid Color Emitter

Fluorescent Glass

High-Brilliance Dishware

Crystal Glass

Construction Material

Glass-Plated Palace

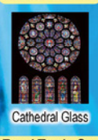
Pioneer of Modern Art

Art Nouveau Glass Artifacts

Cut Glass

Satsuma Kiriko

Stained Glass



Cathedral Glass

Renaissance Glass

Venetian Glass

Silk Road Trade Symbol

Ancient Cut Glass

Colored Glass

Metal Ion Doped Glass

Decorative Impact Glass

Treasure of Tutankhamun

Roman Glass

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Lycurgus Cup

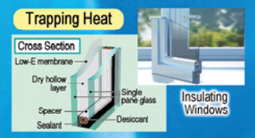
Health Care

Cover Glass for Touch Screens

Induction Stovetops

Mirrors

Trapping Heat



Insulating Windows

Solar Cell Cover Glass

Silica Gel

Architectural Glass

Blackboard Enamel Coating

Glass Wool Insulation

Self-cleaning Coating

Hard Disk Substrates

Automotive Glass

Display Glass

Glass Fiber for Reinforcing Resin

Glass Containers

Stop Fire

Fire-related Glass

Discovering Microorganisms

Swan Neck Flask

Turning Alchemy into Science

Physical & Chemical Laboratory Equipment

Improving Human Vision

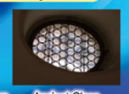
Prescription Eyeglasses

Manipulating Light

Lenses

Glass First Created for Daily Life

Ancient Blown Glass Bottle



Ancient Glass Window

Illuminating the Dark

Light Bulb

Chemical Storage

Pharmaceutical Vials

Quantification of Temperature

©Museo Galileo, Florence

Thermoscope

Seeing the Very Small

Microscope

Seeing the Very Far

Telescope

Discovering Electrons

Vacuum Discharge Tube

Signalling with Light

Lighthouse Lenses

Seeing Through Objects

X-ray Generator

Transmitting Information Worldwide

Optical Communication Fiber

First Aid

Self Injector

Surgical Glass

Artificial Bone

Strage Images

Camera

Communicate with Image

Cathode-Ray Tube

Calculating with Electrons

Computer

Processing with Light

Fiber Laser Processing Machine

Amplifying Light

Optical Fiber Amplifier

Manipulating Electrons

Amorphous Semiconductors

Improving Mobile Devices

Foldable Displays

Diagnostic Tool

Microfluidics Device

Observing from Outer Space

Satellite Telescopes

Detecting Gravitational Waves

Gravitational Wave Measurement Equipment

Exploring the Cosmos

Next-Generation Telescope TMT

Drawing in the nanoscale

Semiconductor Exposure Machine

Detecting Elementary Particles

Photomultiplier Tubes

Creating High Intensity Light

Glass Laser

Generating Electricity in Space

Solar Cell Paddle for Artificial Satellites

Redefining Possibilities

Smart Eyeglasses

Nobel prize winning technologies supported by glass technology.

Science & Technology

Possibilities for Glass Technology are Continuously Expanding

Humans Forming Glass

Glass made from coastal sanc and lightning Cup of Thutmose III

Naturally Forming Glass

Obsidian Arrowhead

~5,000 years ago

Humans begin producing glass ornaments, cups, and bottles, which are opaque due to many impurities.

1st - 4th Century

Glass becomes a daily neccessity. Glass blowing enables the formation of transparent glass windows.

13th - 17th Century

More of the world is "seen" with the advancement of lenses for microscopes, telescopes, and prescription eyeware.

19th Century

Mass production leads to incandescent light bulbs, TV vacuum tubes, and the invention of the computer.

20th Century

High-speed internet is made possible due to glass fibers, optical amplifiers, and ultra-dense semiconductor memory storage.

21st Century - Present

Glass enables the continual development of mobile technology.

Stone Age (~10,000 years ago)

Early humans use naturally-occurring glass as tools like arrowheads and knives.

Glass is Naturally Forming

These are also glassy states!

Metallic Glass Plastic Bottles Formed Candy Bonito Flakes Lake Fly Larvae

Metals, organic matter, and living things can also be in a "glassy" state. When cells are in a glassy state, they are less likely to be destroyed by evaporation or freezing, so glass is used for the dormancy of organisms and long-term preservation of food.

Quantum Computers Spin Glass

Calculations are possible due to irregularly orientated ultrafine magnets which can be described as a glassy state.

Hands-On Experiences with Glass

INTERNATIONAL YEAR OF GLASS 2022

The year 2022 marks the International Year of Glass.

Find events to learn more about glass.

Building a Sustainable Future

Glass is a sustainable, fully recylable and long lifetime material which provides great environmental benefits such as contributing to saving precious natural resources.

To learn more, we invite you to visit our website.

Learn more about glass science, manufacturing, & critical uses in your daily life.

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