Moscow, Russia

www.smartglass.ru, www.tge.ru

Color: gray, green and blue

Cutting Edge Electrochromic Technology

- **Large-sized**
- **Any shape**
- **Low cost**

A new-generation hard electrochromic technology. Unrivalled in optical quality, energy consumption, convenience, safety, reliability, durability. Much cheaper than competition

A wide variety of new exciting applications in various industries

GLASS IS REFERRED TO ELECTROCHROMIC GLASS if it is capable of changing its color within seconds when voltage is applied thereto. This idea is not new, the first developments were made in Russia (USSR) many years ago. Russia continues to be at the forefront of electrochromic technologies. Now the next-generation technology, organic solid state technology has been developed and commercialized.

The wide spread of electrochromic “smart” glass in a wide variety of industries has been hampered by high costs, limited dimensions of products, and other imperfections.

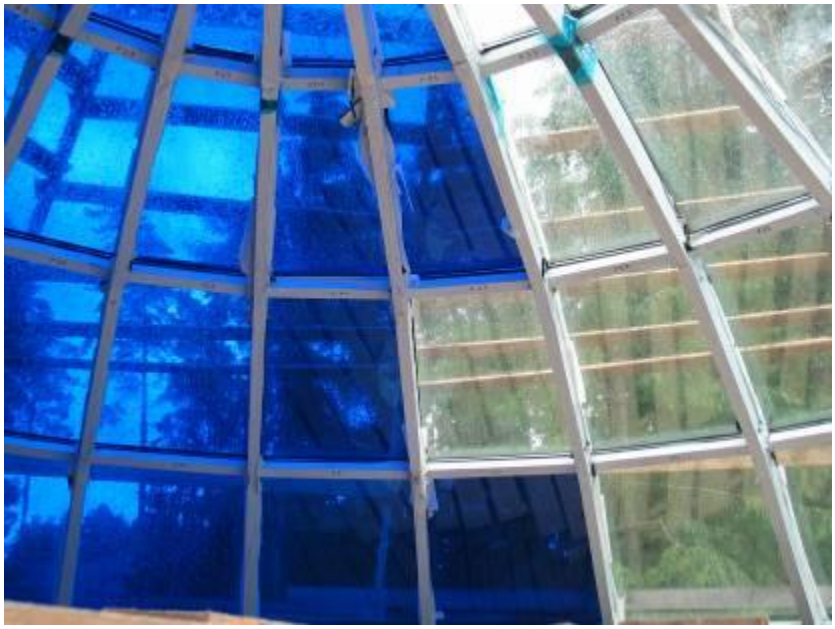
We, Technoglass Engineering (TGE) of Russia, have dramatically improved the technology and reduced the costs of products.

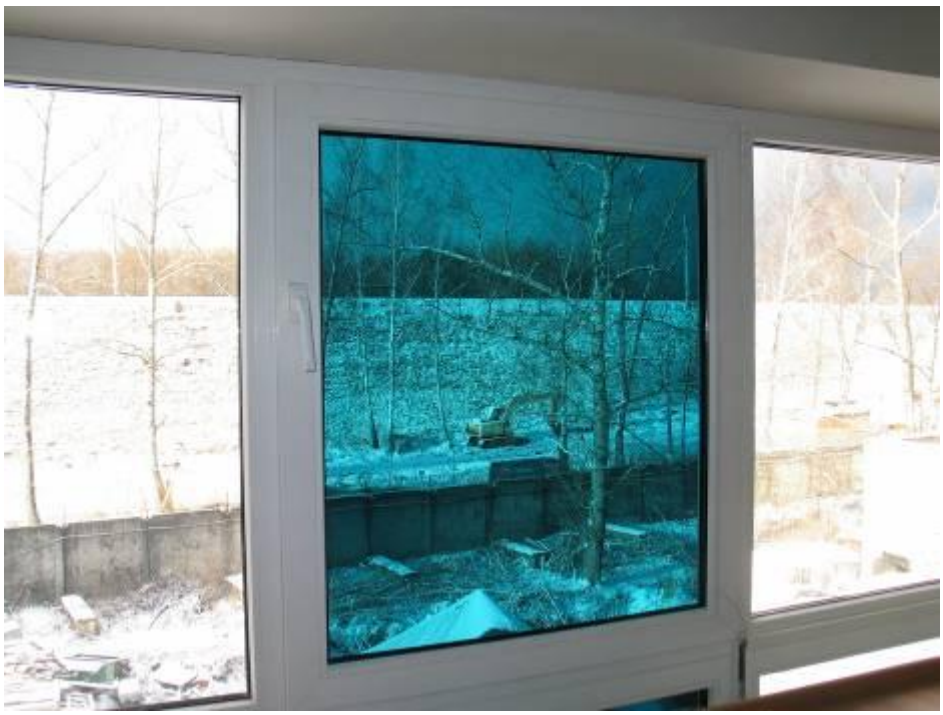
Markets

Architecture & design (glazing)

- Windows
- Doors
- Sunroofs
- Window gardens
- Swimming pools
- Partition walls
- Shop windows
- Stained-glass windows
- Roof elements
- Façade glazing

TGE manufactures single- and two-chamber electrochromic window units for architectural applications.



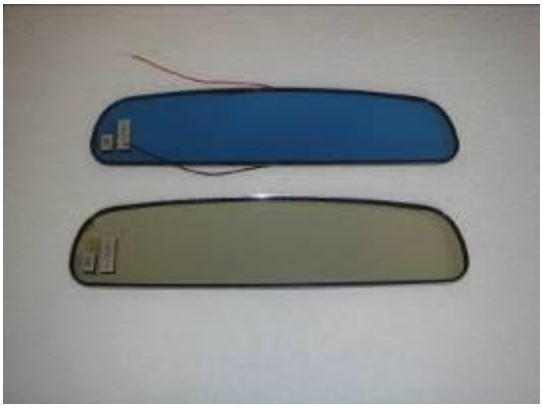


Automotive industries

- Hatches
- Windows
- Rear view mirrors (internal)
- Rear views (external)

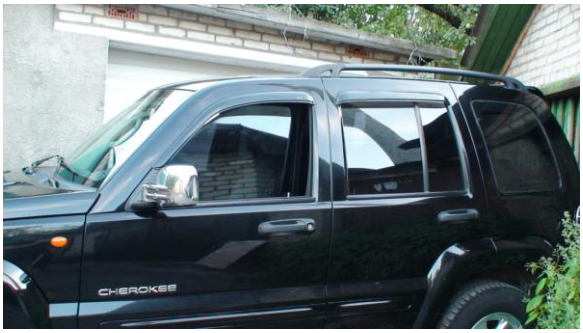
We produce a prototype of:

- Elements for auto-dimming mirrors



- Curved automotive glass (Honda CRV)


- Curved automotive glass (Jeep)

Optical devices

- Light filters
- Spectacles
- Helmets

We supply some prototypes of light filters for two manufacturers of security (CCTV) cameras for testing.

Information technologies

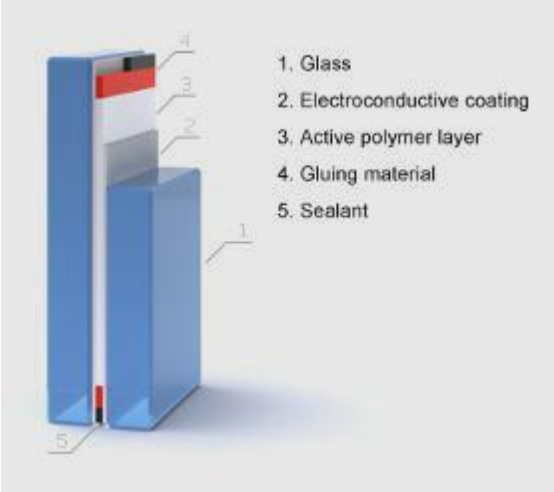
- Indicator systems
- Information boards for collective use
- Displays

Aviation, ship-building, rail-road transport

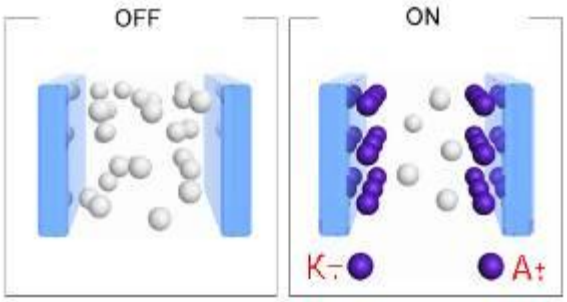
- Illuminators
- Cockpits, etc.
- Partition walls
- Adaptive systems

Russian technology

A FINISHED HARD ELECTROCHROMIC PACKAGE is a triplex of two glasses with electro-conductive coatings glued together by a 1-mm thick uniform jelly-like electrochromic layer. The electrochromic layer is chemically neutral and does not release hazardous substances.



In a normal (OFF) position the electrochromic layer is transparent (unlike some other technologies). When 2-V voltage is applied (ON-position), within seconds the glass becomes tinted in a preset shade of blue colour:



The invention relates to a method for producing electrochromic devices, in particular that having a large working surface area and which does not produce a volumetric shrinkage and can operate for a long maintenance of coloured state of an electrochromic compound, high control voltages and polarity inversion. The inventive electrochromic device comprises at least two electrodes (1, 2), at least one of them being optically transparent. A closed sealed space is formed between said electrodes and filled with the electrochromic compound forming a solid-like film. The inventive method for producing the electrochromic device consists in preparing an initial electrochromic compound in the form of a dispersed electrochromic system which contains at least a suspension and/or colloid. The dispersed medium of said system is an electrochromic solution containing a liquid solvent, cathode and anode components, a disperse phase is a finely dispersed polymer. Afterwards, the initial electrochromic compound is deaerated, thereby eliminating dissolved oxygen and air introduced by said finely dispersed polymer, and is used for filling the space between the electrodes.

At no-voltage conditions the electrochromic glass is transparent. When 2 V voltage is applied, the electrochromic layer changes its color. The process takes some time. The time lag is conditioned by the dimensions and the resistivity of materials used.

The final color density is determined by the concentration of the electrochromic composition.

Patents:

RU 2144937, published on 27.01.2000

RU 2224275, priority date is 26. 09.2002

KR 0718659 based on PCT/RU2003/000414 (WO 2004/029710), priority date is 26. 09.2002

JP 4121501 based on PCT/RU2003/000414 (WO 2004/029710), priority date is 26. 09.2002

US 7295361 based on PCT/RU2003/000414 (WO 2004/029710), priority date is 26. 09.2002

AU 2003271257 based on PCT/RU2003/000414 (WO 2004/029710), priority date is 26. 09.2002

CA 2500199 based on PCT/RU2003/000414 (WO 2004/029710) priority date is 26. 09.2002

Pending Applications:

EP 1560064 based on PCT/RU2003/000414 (WO 2004/029710)

International awards

Most Innovative Product - 100% Detail/RIBA Journal Awards, London, 24 September 2006

Advantages of TGE hard electrochromic technology

Large-sized surfaces of any shape. The nature of the TGE electrochromic layer enables large electrochromic surfaces (up to 2 x 1 m) of any shape to be produced. At the Grad Design Live exhibition in London this summer TGE exhibited the record-breaking 2.5-m long windows.

Stable color characteristics for life. Shades of **blue** and **green.** Forthcoming: **claret**, **black** (**gray**).

Wider working temperature range (–20 – +60°C) as compared with competition. This makes the technology ideal for exterior applications.

Ambient temperature control.

Wider light transmission range – 79–2% (at 1%, the glass is opaque).

High UV stability allows the technology to be used for exterior glazing.

Low working voltage – up to 2 V, which is important for automotive uses.

In OFF position glass is transparent, i.e., during power supply failures the glass is not tinted, which is a problem with some competition.

Images - You can incorporate into a TGE glass any image, e.g., a logo or symbol, thus making your window unique. This image becomes visible in the ON position.

High contrast at any viewing angle and any illumination level.

Lower cost – Can be reduced with the economy of scale.

What we seek:

We are ready to consider any WIN-WIN cooperation proposals, such as:

Technological alliances – Joining forces with global leaders in respective markets in what concerns the development, improving and promotion of new products based on organic electrochromic materials.

Licensing – Any issues pertaining to industries, geography and duration are to be considered. They influence the price.

Joint venture – Construction or upgrading of manufacturing facility. Other JV ideas.

Assignment of patents.

About TGE

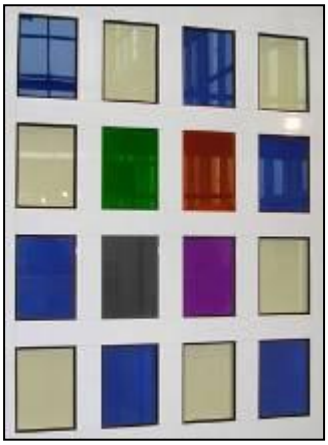
We are an innovation company in the field of organic electrochromic materials and technologies. We are domiciled in Moscow, Russia.

R&D

We started research at TGE in 1975. In actual fact, that was the continuation of the research that had been performed for decades by the "fathers" of international electrochromic technologies Dr. Gavrilov and Dr. Shelepin who joined TGE at that time.

The object of the current R&D is to improve the various aspects of the electrochromic technology and the technology of the manufacturing of EC products. The areas of research are:

- Widening the color spectrum. At the moment at the laboratory experimental samples have been obtained of the following colors: gray (black), red. Other colors are being experimented with.
- Production of the electrochromic film. In 2005 film prototypes were produced.
- Production of larger sizes
- Shortening the dimming time.



Production

In June 2003 we marketed the first product, an electrochromic window for construction and design. At the moment we supply our glasses to manufacturers of windows, office partition walls, etc.

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