



Glafo – the Glass Research Institute



part of the
SP Group

About Glafo

Glafo is a glass research institute that pursues applied research through industry regulated research programmes and joint projects in cooperation with industry. We provide our clients with unique knowledge in the field of glass in the form of research, development, analysis, damage investigations and education

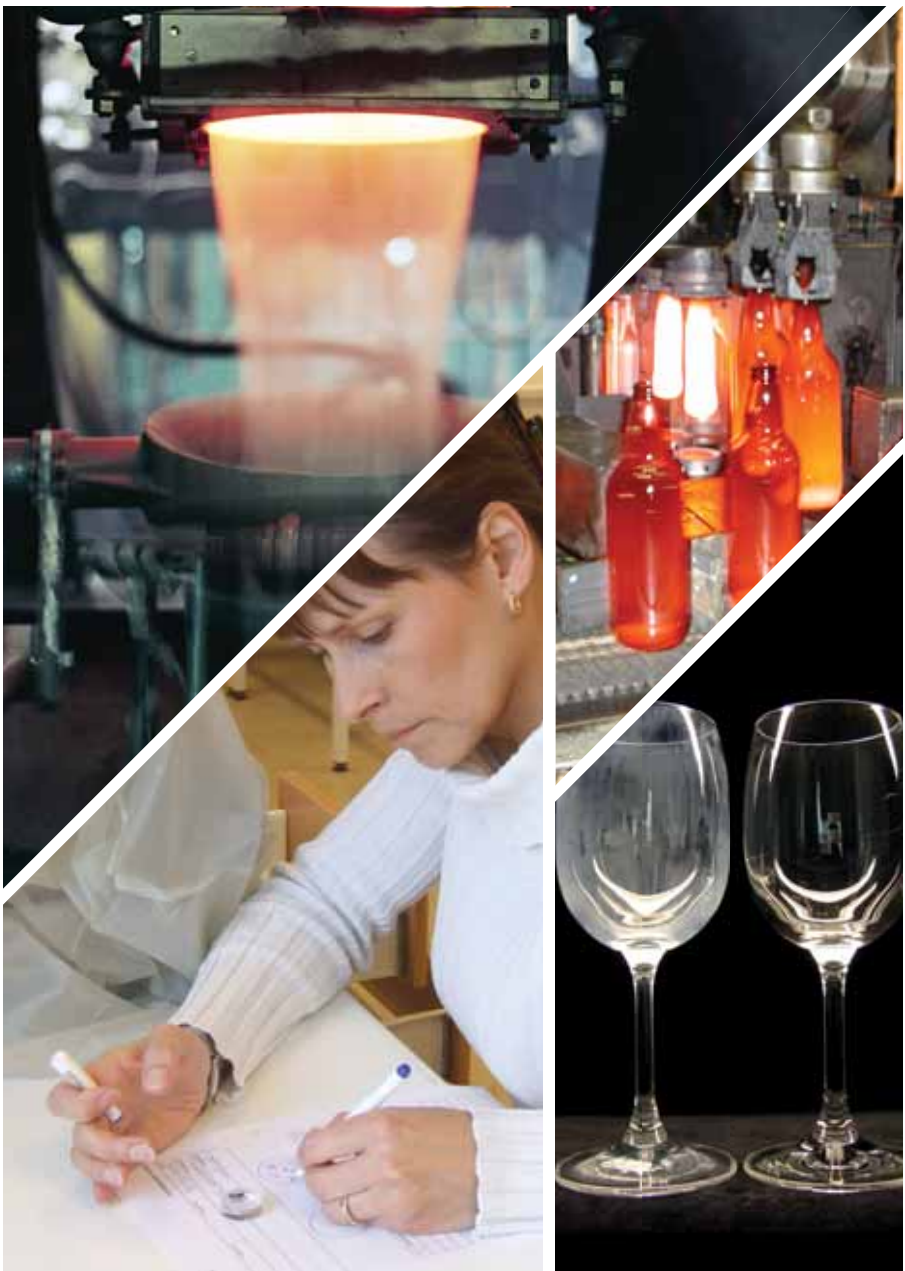
Wide range of services

We work with product and process development as well as aspects such as product safety, durability, efficiency, quality and environment. Acute and strategic problem solving are also included in the wide range of services we provide.

A part of Sweden's leading research institute

Glafo is a part of the SP Technical Research Institute of Sweden. This means that we can quickly involve experts within a range of fields should the call arise. Glafo also coordinates with a number of national and international networks and knowledge centres.





Research and development

- Properties of glass
- Coloured glass
- Decolouring
- Energy balances
- Glass recycling
- Glass surfaces
- Strength
- Glass development
- Glass quality
- Glass melting

Coloured glass

Glafo is one of Europe's leading developers of environmentally friendly coloured glass. Over the years we have accumulated knowledge that is today palpable through our collection of some 3000 coloured glass test pieces, which are available for examination here at Glafo. We develop customised colours that suit different types of glass both to satisfy design requirements and to, for example, prevent specific light wavelengths from passing through.

As yet there is no colour designation system for transparent colours. So we are working on a new system to facilitate communication in the area. The goal is to be able to select a colour and obtain the glass composition required to produce it directly on a computer. This work is being conducted in cooperation with Linnaeus University and the glass industry.

We solve problems and manage projects

We take on assignments in different areas, mainly within glass technology. But our experience and equipment also allow us to work with problems concerning other material technology areas. It is often the case that companies can't find the time to manage development projects. This is where we can step in and take on the project management role. We can also assist in compiling project funding applications for all or parts of the development work.

We are very happy to take on tasks from small private businesses or large corporations. The results are the property of the client and are processed in full confidentiality.



Investigations

- Strength
- Breakage/thermal shock
- Surface damage investigations
- Re-utilization of glass
- Environmental investigations
- Life cycle analysis
- Stresses in glass
- Analysis of glass splinters in food products
- Energy calculations
- Furnace control
- Melting process
- Colour measurement
- Dishwashing and detergents

Melting process

We work with the melting process, which is to say the chain of events that takes the raw material to the end product. We have the experience and equipment needed to conduct studies, test new ideas and increase knowledge levels with respect to chemical, physical and material technology aspects. We also work with questions concerning refinement and alternative applications for the material, glass.

Our laboratory furnaces provide us with the unique opportunity to melt new innovative forms of glass. In these we melt everything from mineral wool to coloured glass and new types of biological glass that will be used in replacement parts for the human body.



Analyses

- Surfaces and layers
- Glass and raw materials
- Defects and inclusions
- Surface damage
- Impurities
- Material analysis
- Glass resistance
- Fake materials
- Quality control of raw materials
- Determination of glass properties such as transformation temperature, expansion, crystallisation etc.



We analyse and investigate

Analysis is one of our specialist areas. We work with the entire process from raw material analysis and wet-chemical analysis of glass to the practical application of the results. We can also analyse and measure coatings which, for example, are applied to window glass to block sunlight.



Moreover we work with surface damage and the analysis of broken glass. If a company wishes to engage an independent damage and incident investigator, we can determine why the glass broke. We are used to the role of problem solver in situations where a client has problems concerning glass but is not totally sure where the problem lies.

Equipment

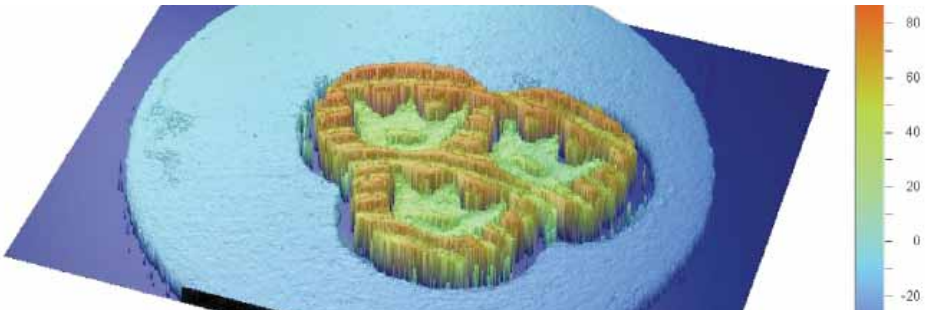
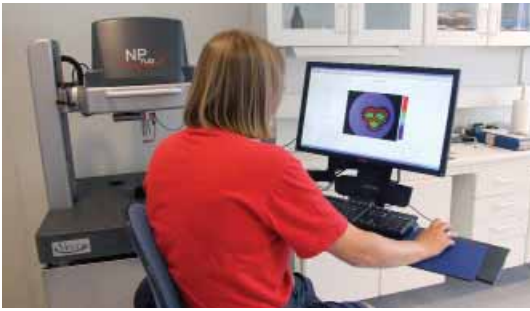
Glafo possesses equipment for analysing both the chemical and physical properties of glass. This we do at, among other places, our wet-chemical laboratory, where we analyse both glass and raw materials. We also have a scanning electron microscope SEM/EDS, which is put to good use in investigation assignments. We use different types of furnace to melt different types of glass in laboratory scale, and using a rotational viscometer, we can determine the viscosity of the liquid glass. Our latest acquisition is an optical profiler.

Our optical profiler

Our optical profiler can be used to examine any surfaces of any significance for quality, performance, appearance and efficiency. Its normal areas of application are fault analysis or investigations into the effects of friction and wear on different materials. It can also be used remotely to characterise surfaces in 3D.

Large scale tests in high resolution

Using the optical profiler we can determine surface roughness parameters and critical dimensions as well as layer thicknesses in high resolution. Tribological applications is another area within which it is very beneficial. The profiler enables examination of large specimens up to several decimetres. The resolution goes down to 0.5 micrometres on the horizontal plane and better than 0.15 nanometres vertically.

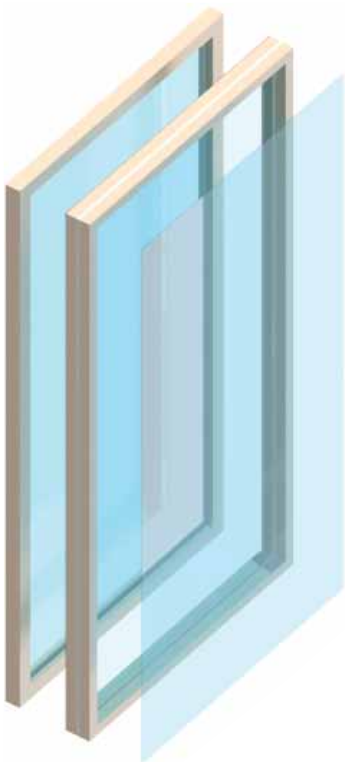


Flat glass and construction glass

Glass as a building material

On the construction side we work with new possibilities, technology and applications. This concerns, among other things, promoting the use of glass as a load-bearing material in constructions. Here we generally work in cooperation with the construction and automotive industries. When it comes to glass in buildings, a whole new spectrum of possibilities opens up. Up till now glass has largely had the role of letting in light via windows, but it is now possible to use glass as building elements. Glass can be used as a load-bearing material to support, for example, beams, pillars and walls. Using glass as a load-bearing element allows it to let in light in a completely different way from simply as a window. Internal supporting walls in glass allow light to pass through the building, meaning that areas that would otherwise be obscured from natural light can now be given it.

When it comes to flat glass, we apply our knowledge and experience in many fields and apply them to glass related products in the construction industry. For example, in windows, smart windows and glass constituents in load-bearing constructions. Smart windows are usually made of flat glass with thin coatings to provide a range of positive properties. Self-cleaning, air purification and reduced solar incident radiation are just a few examples.



We are also working with the future standards for load-bearing glass. Through engagement in the standardisation work, we gain the opportunity to influence the future standards, which is to say the regulations and requirements for products/services. At the same time, we receive early information on market trends and the demands of authorities.



Our specialist areas

- Genuine expertise in glass chemistry and glass as a material
- Knowledge and experience from the construction industry and the automotive industry within flat glass applications and strength calculations for glass
- Experience in the industrial production of glass
- Interplay between glass and other materials
- Knowledge of crack formation in glass
- Packing glass
- Mineral wool

Coordination with the SP Group

Through our association with the SP Group, we can help to form project teams to help clients with problems that concern other materials than glass. Close cooperation with SP has many benefits when it comes to, for example, environmental and energy questions. We work with energy effectiveness questions regarding both the production and application of flat glass.



Glass in the future

In the future we will expand our operations primarily within the field of flat glass, but we also intend to grow within the fields of special glass for, for example, glass fibre with special requirements as well as glass for use in the electronics industry.

Membership

Membership with many benefits

Through membership in the Glass Research Association, Glafo, you gain access to the services of the country's leading glass experts. As a member, your company receives prompt, direct help with acute problems as well as assistance with longer term questions. We provide you with an effective springboard for faster and safer development of your company's technology, production and products.

An annual research subscription is set by the members.

For more information, visit www.glafo.se

Education and information

We arrange courses in glass technology and compile educational and information material. In addition we have produced the book "*An Introduction to Glass – Craft, technology and art*" in both English and Swedish. We have the secretariat for NGF, Scandinavian Society of Glass Technology, and arrange seminars etc. on themes associated with the various aspects of glass.



