FLOAT GLASS TECHNOLOGY

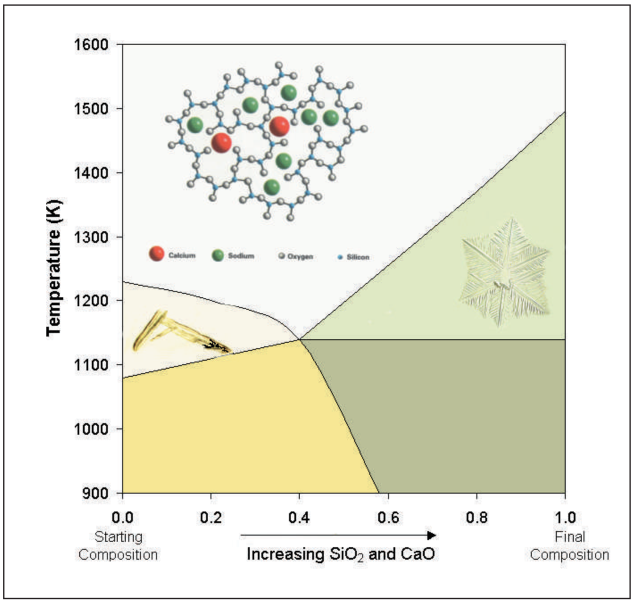
Float batch is melted using the heat generated through the combustion of fossil fuels

In order to retain its position as world leader in glass technology and innovation Pilkington invests significant research funds into the optimisation of the manufacturing process. In recent years key advances have taken place in the development of glass compositions, in float furnace design and operation and in the forming process.

Glass is melted with the heat supplied from the combustion of fossil fuels. Research is conducted into burner design in order to ensure that the flames have the maximum luminosity and impinge on the glass at the correct angle, thus ensuring that fuel consumption is minimised and glass quality is of the highest order.

Monitoring of the fuel to combustion air ratio is critical to ensure optimum heat generation and minimisation of NOx emissions. NOx species generated from fuel combustion, which when released into the atmosphere act as pollutants, are reduced down to ppm levels by Reaction and Reduction in the Regenerators, the Pilkington 3R™ process.

Advances in modelling provide an essential contribution towards the retention of Pilkington's leading edge position in glass research. The diagram below illustrates how thermodynamic modelling assists in the optimisation of glass composition and affords control over devitrification characteristics through the prediction of the primary phase fields.



Phase fields

The diagram shows how the liquidus (the temperature at which solids can form in the melt) varies as a function of glass composition.

Computation of such diagrams has been possible for some time but only for simple two component systems, for example SiO_2-Na_2O. However, extensive collaborative research with thermodynamic experts at the National Physical Laboratory has resulted in the ability to predict the properties of much more complex systems.

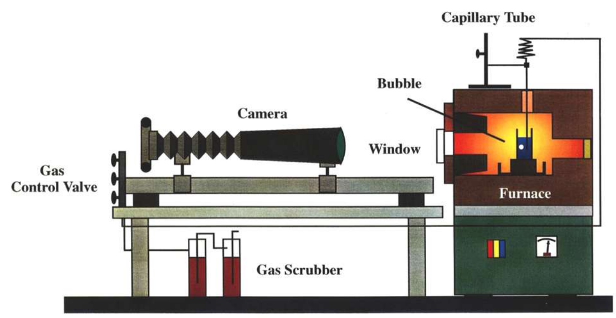
Microscopy is an important tool used at the Pilkington European Technical Centre for the identification of the types of solid inclusions that may be found in float glass. The inset pictures are high magnification images of wollastonite and tridymite crystals, affording an insight into the microstructures of the solids that form in the different compositional regions and confirming the results of the thermodynamic predictions.

As well as solid inclusions, bubbles may also form in the float glass. Extensive work is being carried out within the Melting Group to fully understand the behaviour of bubbles in molten glass so that production losses through bubble faults can be minimised. The characteristics of bubbles of different gases in glass are studied at high temperatures in the laboratory using the experimental arrangement shown in the diagram below.

The basic information from these studies provides a foundation for computer modelling work.

Float forming has undergone continuous development since the process was first introduced for commercial flat glass manufacture in 1959. Today, advances in bath technology enable glass to be made as thin as 0.3mm or as thick as 25mm.

Exploitation of the results of Research and Development work has enabled Pilkington to manufacture float glass with the lowest defect rates in the world. Currently the Group's float furnaces produce less than 1 pin head sized bubble in every 40 m^2 of glass produced. State of the art fault detection systems ensure even this tiny number of defects will not survive in glass sent to the Group's customers.



High temperature photography of bubbles in molten glass

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