



Glass Industry Research – A New Approach

Ongoing research is an essential part of any industry moving forward. Glass is no exception.

With the creation of the Glass Manufacturing Industry Council to serve as a “convener” for the industry, a collaboration from 1995 to 2002 with the Department of Energy spurred the development of a number of key “pre-competitive” technologies. Industry professionals identified priorities for research needs and the GMIC helped to create “consortia” to pursue them.

DOE cost-shared funding led to a number of valuable technologies brought to market.

But, starting in 2001, as other priorities took precedence, the DOE continually reduced research funds to the point where, in 2007, the agency allocated no research funds to the glass industry.

There is a positive side of this development, however. Through our years of working together with sources of funds, identifying research laboratories and institutes, defining priorities and creating viable consortia, the industry is now in a position to develop its own research portfolio.

In 2007 a survey of GMIC members (glass companies) led to the identification of a number of priorities for research. Here are two of the focus areas identified:

Strength: Achieving levels of strength closer to theoretical is vital for our industry. Some of the specific areas requiring attention are techniques in micromeritics and surface characterization, and advanced modeling of surfaces to design corrections that will heal Griffiths’ flaws and protect glass from creating new flaws.

Changing value of glass surface: nanofunctionalizing glass and glass fibers; surface changes; coatings; glass durability improvements; self-cleaning; hydrophilic properties; holography.

We sent out an RFP to our university members that resulted in nine proposed projects. Our member companies reviewed them to determine interest and priorities for future projects. Of the original nine, five are still in contention for further consideration. They are:

- **Microwave Surface Treatments for Enhanced Strength and Mechanical Reliability**

Investigators propose several different microwave-based processes for enhancing glass strength and reliability: Carlo Pantano and Chris Fang, Materials Research Institute, Penn State University

- **Nanoscale Carbon Coatings**

This is a proposal to explore a promising new coating material for glass—graphene, i.e., a single layer of graphite, a monolayer of sp^2 carbon, with remarkable properties: Carlo Pantano, Hoikwan Lee and Josh Robinson, Materials Research Institute, Penn State University

- **Ion-Exchange Process Improvements**

The proposal suggests a project to explore alternative approaches that could conceivably lead to improved economies and efficiencies for ion-exchange strengthening: Minoru Tomozawa, Materials Science and Engineering, Rensselaer Polytechnic Institute.

- **Failure Characteristic and the Ultimate Strength of Silicate Glass**

This project would develop an understanding of how glass composition and structure affect the failure characteristics of modified

silicate glass, leading to stronger composition designs that are less susceptible to flaws: Richard K. Brow, principal investigator, University of Missouri-Rolla; Charles R. Kurkjian, University of Southern Maine; Prabhat K. Gupta, Ohio State University.

- **Multifunctional Coatings for High-Performance Glass Surfaces**

This project proposes to explore functional coatings that will improve durability and wear resistance, and engineer different interfacial and optical properties: Darran Robert Cairns, Department of Mechanical and Aerospace Engineering, West Virginia University

Our members continue to evaluate these proposals to determine their interest in supporting one or more. Once the “votes are in,” we will ask the proposing investigators to prepare more detailed proposals for study by task forces formed from among supporting companies. We will then explore funding sources that would permit the projects to go forward.

The white papers describing these projects are available on our web site, www.gmic.org. Readers interested in supporting a particular project are invited to contact the GMIC.

The future of the glass industry is up to all of its “players.” It’s not a zero-sum-game. As we improve the nature and qualities of glass, the economy and efficiency of its production, and the ability to operate in more and more forms and applications, all of our fields of action will expand. The best years for glass are still to come!

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