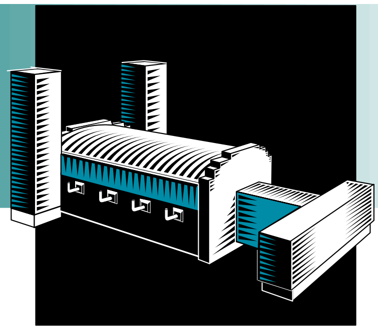
GLASS
Project Fact Sheet



Process Optimization Strategies, Models, and Chemical Databases for On-Line Coating of Float Glass

Benefits

- Reduced solid waste generation and associated disposal costs
- Reduced usage of raw materials
- Minimization of energy consumption
- Higher yield of coated products
- More efficient use of costly chemical precursors

Applications

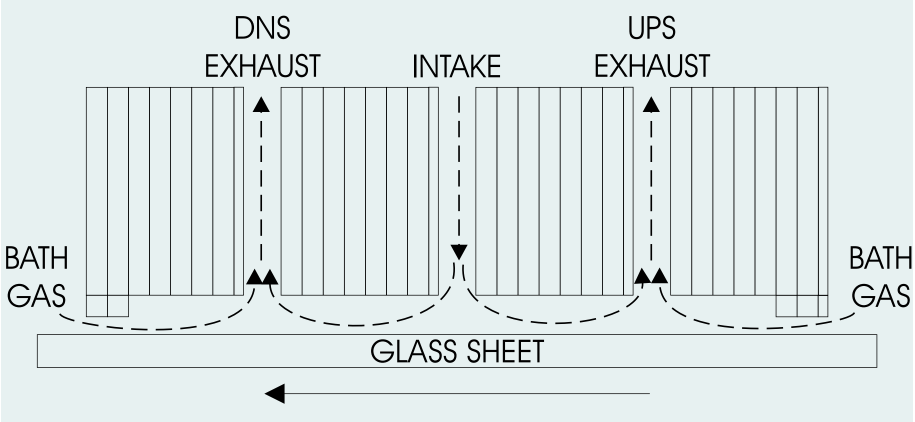
The resulting technology will be applied to the on-line atmospheric pressure chemical vapor deposition (APCVD) technique currently used to produce approximately 110 million square feet of value-added products per year. The new strategies developed during this project will improve the efficiency of depositing tin-oxide coatings primarily for the flat glass sector, but container and specialty glass makers may also benefit from the technology. Specific uses for the technology include: low emissivity and solar-control glasses for architectural applications, photovoltaic solar cells, computer screens, automotive applications, and xenography.

New Control Strategies and Process Models Will Double the Efficiency of Depositing Coatings on Float Glass and Glass Containers

On-line atmospheric pressure chemical vapor deposition (APCVD) is a critical, complex process used to deposit coatings on float glass and glass containers. Although APCVD is the most cost-effective method for depositing coatings, process inefficiencies lead to high production and waste disposal costs. Technology that can improve the efficiency of APCVD can save the glass industry millions of dollars in disposal costs and reduce energy consumption.

This project seeks to double the rate of efficiency of reactant utilization by developing modifications to the APCVD technique as well as new coater designs. Project partners plan to increase efficiency by developing computational models that can predict defects in coatings such as film thickness nonuniformity, pinhole defects, and haze. By preventing coating defects, these new strategies can reduce the amount of glass to be remelted and consequently save energy. Such technology will also reduce raw material usage.

Float-Glass Coating Unit



Schematic of a typical float-glass coating unit. UPS = upstream; DNS = downstream.

Project Description

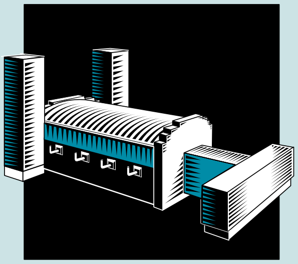
Goal: Develop modifications to existing coater designs and/or develop new coater designs for on-line atmospheric pressure chemical vapor deposition (APCVD).

APCVD uses materials such as organo-tin precursors to deposit tin oxide films on glass. The process requires multiple chemical precursors to be involved in complex chemical gas phase reactions. With a better understanding of the chemistry involved, researchers can identify strategies to reduce by-products and coating defects that cause process inefficiencies.

During this three-year project, researchers will begin by conducting detailed theoretical and experimental studies of the underlying deposition process. Deposition chemistry results will be used to develop Computational Fluid Dynamics (CFD) models that can identify factors leading to poor reactant utilization, coating nonuniformity, and defect formation. Using modeling results, researchers will develop strategies to be tested on-line in pilot and full-scale facilities.

Progress and Milestones

- The project was awarded in late 2000.
- Researchers will conduct theoretical and experimental investigations needed to understand the chemistry involved in the APCVD process.
- On-line measurements of gas-phase and surface reaction rates will be performed in coating units.
- Deposition experiments for defect analysis will be conducted, and model validation will be obtained.
- The resulting technology strategies are expected to yield the following results:
  - Savings of $2 million per year per coating facility
  - Energy savings of 75 billion Btu per year



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