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SAINT-GOBAIN
RECHERCHE

Aubervilliers, 13th March 2013

***Subject* : Support letter to ISTRESS collaborative project**

Dear Sirs and Madams,

Saint-Gobain, a world leader company in the habitat and construction markets, designs, manufactures and distributes building materials, providing innovative solutions to meet growing demand in emerging economies, for energy efficiency and for environmental protection.

Saint-Gobain is constantly innovating to make homes more comfortable, cost-efficient and sustainable worldwide. Our solutions span from self-cleaning windows and photovoltaic glass to smart insulation systems, water supply systems, solar solutions and building materials distribution.
Market leader in all our businesses, we offer solutions to the major challenges of energy efficiency and environmental protection. As one of the top 100 industrial groups in the world, Saint-Gobain continues to deploy its technological know-how, often in partnership with the most prestigious universities and laboratories. To give an idea of the commitment to innovation, 20% of Saint-Gobain products did not exist five years ago.

Saint-Gobain Recherche is a multidisciplinary industrial research centre that works on designing tomorrow's products and processes dealing with habitat, energy and environment. It is one of the 7 main R&D centres of Saint-Gobain and we share specific key skills with each other. Saint-Gobain Recherche skills are in the areas of glass, surface coatings, reactive materials (polymers, gypsum, mortar) and we deal in general with habitat, which encompasses a wide range of scientific disciplines.

In the building or automobile industry, glass surfaces' sole purpose is no longer to just ensure that natural light passes through. We provide them with functions such as: reinforced insulation, solar control or anti-reflective, water-repellent or self-cleaning properties. These functions are often added by providing thin layers or surface treatment.
In the near future, glass will become active or indeed even interactive: artificial lightening, photovoltaic, solar supply (electrochromic) dynamic control or display. We consequently participate in the development of improved integrated glazing system.

In order to access such functions using the new materials (composition or structure), SGR teams of researchers study the coating processes in a controlled atmosphere as well as chemical or physico-chemical treatments.

In the area of thin film functionalized glass, one of the prime current products is the low emissivity glass (low E) for thermal control. By itself, the low E glass market in Europe weights 200 M€, with an expected several times increase in the next few years due to new energy saving practices and regulations. In addition, numerous novel applications relying on coated glass technologies are targeted by all major players in glass manufacturing in fast growing markets such as flat panel displays or solar cells. As a result, increasingly complex film stacks are being developed.

However, one of the major limitations to the development of complex functional coatings is the mechanical stability of these structures. Failure may occur at various stages and for various reasons but one of the prime sources of failure is delamination due to severe contacts with tools or foreign bodies during the processing or in service. Such failure usually results in unacceptable optical defects. Finally, the technological problem is complexified by the necessity to carry out glass product transformation at elevated temperatures after deposition for tempering, forming and annealing. Severe mechanical damage due to scratch often occurs during this high temperature phases.

The typical films predominantly consist in oxide and metallic layers. Two major phenomena conspire to weaken the mechanical stability of these films under contact loading: weak adhesion of the films, which could be improved through interfacial physical-chemistry, and residual stresses which must be controlled in the deposition and thermal processes.
Therefore a full understanding and optimization of the residual stresses is necessary for the design of mechanically robust coatings. Saint Gobain Recherche has developed sound knowledge in the measurements of macroscopic stresses by bending and x-ray diffraction in individual layers. Unfortunately no technique exists at the moment for the measurements of residual stresses in amorphous of bad crystallized layers or for stacks of multiples films as i.e. Saint Gobain low emissivity coatings.

On that ground we have a strong interest in technique that will be developed in the framework of the ISTRESS collaborative project. We expect that this technique will allow measuring residual stresses in amorphous thin films, which thicknesses below 100 nm, both before or after thermal treatments, or to measure residual stresses distribution in stacks of several layers each one having thicknesses below 50 nm.

Saint Gobain Recherche is therefore available to take part to the Industry-oriented Advisory Board.

Saint Gobain Recherche intends to provide samples to the ISTRESS project. Two kinds of samples will be provided. The first kind will be constituted of individual layers of different materials deposited by PVD at different thicknesses and at different stress levels in order to study the lowest measurable thickness and the sensitivity for residual stresses measurements.
The second kind of family will be constituted of complex stacks, having the structure of the products of Saint Gobain in order to reconstitute the stress profile through the thickness.

We hope therefore that the submitted ISTRESS project proposal will be successful and that the project will attain successfully the expected results.

Best regards,

Gérald FAFET
Managing Director
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