
Iridescent glass for packaging decoration

Babacar Diallo^{*†1}, Alex Capelle², Inigo Gonzalez¹, Cédric Blanchard³, Cécile Genevois¹,
Vincent Sarou-Kanian¹, Farah Inoubli³, Martin Depardieu⁴, Anne-Lise Thomann⁵,
Nadjib Semmar⁵, and Nadia Pellerin³

¹CEMHTI (Conditions Extrêmes et Matériaux : Haute Température et Irradiation) – CNRS :
UPR3079, 1 Av. de la Recherche Scientifique, 45100 Orléans, France – France

²GREMI (Groupe de Recherches sur l'Energétique des Milieux Ionisés) – CNRS : UMR7344, 14 Rue
d'Issoudun, 45067 Orléans, France, Université d'Orléans, Decor World Services – France

³CEMHTI (Conditions Extrêmes et Matériaux : Haute Température et Irradiation) – CNRS :
UPR3079, 1 Av. de la Recherche Scientifique, 45100 Orléans, France, Université d'Orléans – France

⁴Decor World Services – Decor World Services – France

⁵GREMI (Groupe de Recherches sur l'Energétique des Milieux Ionisés) – CNRS : UMR7344, 14 Rue
d'Issoudun, 45067 Orléans, France, Université d'Orléans – France

Abstract

Glass decoration has become a major challenge for cosmetics, perfumes or wines and spirits packaging manufacturers, particularly represented in the Centre-Val de Loire Region (France). Many processes are used to aimed to glass coloration or glass surface and volume texturing. Among the printing processes, screen printing or transfer marking are used to obtain logo, text, or pattern on a glass surface. Laser pickling processes make it possible to obtain a certain surface texturing offering a particular decorative aspect while laser engraving achieves to print very fine patterns on the glass surface or volume. To accommodate the growing demand in this area, the development of new processes based on laser technology and making it possible to obtain iridescent patterns on the glass surface or volume, is envisaged to replace certain polluting processes currently used. Glass phase separation is also a promising process to drive the glass coloration and iridescent appearance by controlling the phase separated domain size, dispersion and optical index. We will present the optical numerical simulation model based on Mie scattering theory which allows to guide the glass synthesis by defining the favorable relationship between glass microstructure and optical index to obtain iridescent phenomenon. The glasses physico-chemical and optical properties obtained from exploration of borosilicate and aluminoborosilicate chemical systems will be also presented. X-ray diffraction, and electron microscopy observations and analyses have been carried out to identify the nature, size, shape and distribution of the phase separated domains controlled by the glass chemical composition and thermal treatments. The glasses structural properties have been investigated by high-resolution solid-state nuclear magnetic resonance spectroscopy while optical properties have been determined thanks to absorption and diffusion measurements in a large spectral range. First results of the interaction of phase separated glass surfaces with an infrared laser beam will be exposed.

Keywords: Phase separation, structure, iridescent glass

^{*}Speaker

[†]Corresponding author: babacar.diallo@cnrs-orleans.fr