Erosion of glass surface by sand blasting

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In most applications of glass surface (building, Windshield, solar panels, aeronautics,…) is exposed to a variety of external aggressive conditions such as chemical reactions and mainly mechanical damage by erosion.
In a previous work, we considered the effects of the sand blasting on the surface of soda-lime glass by simulating a sandstrom. The results showed that the glass erosion affects both the optical transmission and the mechanical resistance. Microscopic observations reveal that the damage is similar to that of sharp indentation damage type Vickers indentation.
In the present study, we are interested in the effect of sand blasting parameters on the evolution of craters depth and the residual stress around the impact. We noticed that the depth vary of 0.6 to 15 μm. It increases when the grains size and the velocity of particles increase.
The glass strength is well-known to be affected by its surface condition. Indeed, the formation of cracks and craters with sufficient depth constitutes a dominant defect.
Based on the expression of the energetic concept defined in the literature and to follow the evolution of glass surface damage by sand blasting, we introduced a damage model characterised by the volume affected by impact. This critical efficient volume is a function of local impact duration and local critical stress. The initiation and propagation of lateral, median and radial cracks depend on this volume. Indeed, The erosive wear of brittle materials by particles impact is caused by localised cracking and the intersection with each other and with the surface leads to material removal. In order to evaluate the concept of the local fracture criterion by chipping, a numerical calculations by FEM have been performed.

Keywords: Erosion, Glass surfaces, sand blasting, roughness profiles, model, impact energy

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