

Mesoscopic Defects of Forming and Induced Properties on the Impact of a Composite Glass/Polyester

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Abstract : Forming processes induce residual deformations on the reinforcement and sometimes lead to mesoscopic defects, which are more recurrent than macroscopic defects during the manufacture of complex structural parts. This study deals with the influence of the fabric shear and buckles defects, which appear during draping processes of composite, on the impact behavior of a glass fiber reinforced polymer. To achieve this aim, we produced several specimens with different amplitude of deformations (shear) and defects on the fabric using a specific bench. The specimens were manufactured using the contact molding and tested with several impact energies. The results and measurements made on tested specimens were compared to those of the healthy material. The results showed that the buckle defects have a negative effect on elastic parameters and revealed a larger damage with significant out-of-plane mode relatively to the healthy composite material. This effect is the consequence of a local fiber impoverishment and a disorganization of the fibrous network, with a reorientation of the fibers following the out-of-plane buckling of the yarns, in the area where the defects are located. For the material with calibrated shear of the reinforcement, the increased local fiber rate due to the shear deformations and the contribution to stiffness of the transverse yarns led to an increase in mechanical properties.

Keywords : Defects, Forming, Impact, Induced properties, Textiles

Conference Title : ICMSET 2019 : International Conference on Material Science and Engineering Technology

Conference Location : Paris, France

Conference Dates : December 30-31, 2019