UNDERSTANDING AND CONTROLLING THE FINAL PROPERTIES OF FIBER-REINFORCED COMPOSITES MANUFACTURED BY LIGHT PROCESSES

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Composite materials are mainly achieved under thermal curing. This implies that reaction occurs either at elevated temperature, involving high energy consumption, or at ambient temperature meaning a limited control of the reaction and thus a very slow process. A technical migration to a fully light-driven process could be a sustainable alternative to thermal curing and overcome many of its technological issues. It is indeed a reliable technology working at ambient temperature with reaction times lasting minutes rather than hours. Despite all of these benefits, photocomposites remain still marginal. One main limitation of a wider and more systematic use of light to manufacture composites is that the photons need to penetrate the material to generate reactive species. The presence of fibers as reinforcing phase may also worsen this problem by reducing even more the transmission of light. Some academic works successfully describe the manufacturing of photocomposites but limited information related to their mechanical properties can be found. This presentation will focus on the key parameters influencing the photocomposites properties. The control of the conversion is a crucial factor for prepreg processing. Therefore, the influence of a single or a two-step dual irradiation will be discussed. The balance existing between the concentration of the photoinitiator, its photobleaching efficiency will be highlighted with evaluation of the in-depth conversion and shrinkage measurements. In order to see how the conversion inhomogeneity could affect the mechanical properties, interlaminar shear strength (ILSS) has been assessed for different laminates.

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