INFRARED THERMOGRAPHY IN THE CHARACTERIZATION OF THERMOPLASTIC COMPOSITES

Simone Boccardi[a], Giovanni Maria Carlomagno[a], Carosena Meola[a], Pietro Russo[b], and Giorgio Simeoli[b]

[a]Department of Industrial Engineering - Aerospace Division, University of Naples Federico II, Naples, Italy
[b]Institute for Polymers, Composites and Biomaterials, National Council of Research, Pozzuoli (Na), Italy

The attention of this work is focused on the use of infrared thermography on the characterization of thermoplastic composites. Different types of composites are considered involving either polypropylene (PP), or polylactic acid (PLA) as matrix. In particular, polypropylene is used either neat, or grafted with maleic anhydride, and reinforced with either glass, or jute, fibers. PLA is reinforced with jute fibers. All specimens are subjected to: cyclic bending, quasi-static bending and impact tests. During each type of test an infrared camera views one specimen surface and records sequences of thermal images. From post-processing of such images it is possible to derive important information about the different composite materials. The analysis of thermal effects coupled with cyclic bending supplies information useful to understand more on macromolecular interaction and interfacial micromechanics effects through a link between the phenomena arising at the microscopic level with the effects at the macroscopic level. The online monitoring of quasi-static bending and of impact tests allows following initiation and propagation of damage. From the observed thermal effects (thermoelastic and thermoplastic) it is possible to discriminate between the different types of composites and account for the role played by the coupling agent in the polypropylene matrix. These types of information are derived with infrared thermography in noncontact, nondestructive and in a rather fast way.