KN-2-527

Tuesday, May 10, 2011, 02:35-03:15 pm
Room: Reda 5

DEVELOPMENT OF MULTIFUNCTIONAL ADVANCED COMPOSITES WITH POLYMER NANOCOMPOSITE MATRICES

Luigi Torre [a*], Marco Monti [a], Maurizio Natali [a], Marco Rallini [a], José M. Kenny[a,b]

[a] *University of Perugia, Civil and Environmental Engineering Department, Strada di Pentima 4, 05100 Terni and* [b] *Institute of Polymer Science and Technology – CSIC – Juan de la Cierva 3, 28006 Madrid, Spain*

**Corresponding author: torrel@unipg.it*

Polymer-based fiber reinforced composite materials are widely used in applications in which they have a structural role, in many different sectors such as aerospace, automotive and civil engineering. In these cases, it is very important to have the chance of detecting the presence of strain accumulation and the presence of any damages, which can worsen the mechanical resistance of the composite itself. The use of techniques that exploit electrical properties of the composite to monitor damages has been recognized as a non-invasive way in carbon fiber reinforced plastic, since the good electrical conductivity of carbon fibers themselves. In fact, in this case, fracture of fiber results in a strong increase of electrical resistance. Nonetheless, this approach does not consider the fractures involving the matrix and the fiber-matrix interface, so it can give just a partial view of what could happen inside the composite during a mechanical solicitation. Moreover, it can not be employed with non-conducting fibers, e.g. glass or aramid. For this reason, some researchers investigated the possibility of the employment of electrically modified polymeric matrices. In this study, both an unsaturated polyester and an epoxy resins were doped with carbon-based electrically conductive nanoparticles, such as carbon nanofibers and nanotubes, in order to obtain a matrix with enhanced electrical conductivity for the production of a glass fiber reinforced composite. Glass and carbon fiber reinforced composites produced by liquid molding processes, were studied by mechanical and electrical tests. In particular, for the polyester-based composite a flexural load was exerted at the same time as electrical resistance was measured, in order to verify whether any change in resistance is related to the mechanical stress. On the other hand, the possibility on monitoring the presence of a damage for the epoxy-CNT-matrix composite was focused on impact damage.