DIPARTIMENTO DI CHIMICA

SAPIENZA
UNIVERSITÀ DI ROMA

Seminario di Dipartimento
27/11/2014 aula Parravano (Istituto Cannizzaro) ore 15:00

Nanocarbons: dispersion and application

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The utilization of highly branched polymer (e.g., epoxy resins) in engineering applications is often limited by their brittle nature (low fracture toughness). Loading the polymer matrix by fillers such as individual nanotubes or graphene is a promising alternative to enhance fracture toughness without compromising other mechanical properties. However, to fully understand the nanotubes toughening role and correctly characterize the nanocomposite failure mechanisms, a complete exfoliation of the nanotubes aggregates into individual nanotubes is essential. In this work, we embed only individual nanocarbons in the polymer matrix using a novel dispersion method. Their concentration in the composite is accurately determined. We achieve a record fracture toughness enhancement and, for the first time, demonstrate a coherent quantitative correlation between the fracture toughness and the surface roughness. Finally, a comprehensive statistical investigation of the nanotube failure mechanisms shows that carbon nanotubes fail via fracture mechanism, while tungsten di-sulfide nanotubes via pullout mechanism. The failure mechanism could be predicted by the slope of the surface roughness vs. fracture toughness curve.

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