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Magnetic Field Induced Mechanical Behavior of Fluid Filled Carbon Nanotube Foam

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Abstract : Excellent energy absorption capability in carbon nanotubes (CNT) is shown in their bulk structure that behaves like super compressible foam. Furthermore, a tunable mechanical behavior of CNT foam is achieved using several methods like changing the concentration of precursors, polymer impregnation, non covalent functionalization of CNT microstructure etc. Influence of magnetic field on compressive behavior of magnetic CNT demonstrated an enhanced peak stress and energy absorption capability, which does not require any surface and structural modification of the foam. This presentation discusses the mechanical behavior of micro porous CNT foam that is impregnated in magnetic field responsive fluid. Magnetic particles are dispersed in a nonmagnetic fluid so that alignment of both particles and CNT could play a crucial role in controlling the stiffness of the overall structure. It is revealed that the compressive behavior of CNT foam critically depends on the fluid viscosity as well as magnetic field intensity. Both peak Stress and energy absorption in CNT foam followed a power law behavior with the increase in the magnetic field intensity. However, in the absence of magnetic field, both peak stress and energy absorption capability of CNT foam presented a linear dependence on the fluid viscosity. Hence, this work demonstrates the role magnetic filed in controlling the mechanical behavior of the foams prepared at nanoscale.

Keywords : carbon nanotubes,magnetic field, energy absorption capability and viscosity
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