Carbon Fiber is a material consisting of microscopic fibers composed mostly of carbon atoms. Addition of carbon nanotubes to industrial polymers greatly increases their mechanical strength; carbon fiber-reinforced polymer is an exceptionally strong and light form of reinforced plastic also containing carbon fibers. Although these polymers can be expensive to produce, they are popular wherever high strength-to-weight ratios and rigidity are required.

In the process of making carbon fiber nanotubes, it is necessary to align the short fibers in an ordered manner. In order to accomplish this, the fibers must be modified. This invention describes a new method of applying those necessary modifications. Additionally, this method enables the modification of these carbon fibers using a safe, non-toxic, cheap, water-based solvent. The modification of these carbon fibers facilitates their assembly into bundles that can result in improvements to the mechanical properties of produced composite materials.

This innovation will improve production of carbon fiber-based materials and the associated industrial composite materials resulting in enhancements to their mechanical performance through better adhesion, alignment, and cross-linking. Although carbon fiber-based materials are widely produced, this method has a number of advantages over the current practices. In the existing methods, addition of the crucial modifications results in the breaking of carbon-carbon bonds which reduces the mechanical strength of the produced composite; the method disclosed here is non-destructive and therefore able to preserve the structural integrity of the carbon fibers. As was alluded to above, this invention involves the use of a water-based solvent that is non-toxic, cheaper, and safer than is currently used by industry. This method also allows for the replacement of other more expensive chemicals that are commonly used and is capable of making use of carbon sources commonly considered waste by the industry reducing the overall cost of production.

Unmodified carbon fibers

Carbon fibers modified by the flakes of maleic anhydride-functionalized graphene by simple dipping to their aqueous dispersion