

CLAIMS

1. A conductive carbon fiber reinforced composite comprising:
a metal-coated carbon fiber fabric laminated with a nanocomposite resin, the
5 nanocomposite resin comprising a mixture of: a polymerizable thermosetting
polymer, a conductive filler, and a carbonaceous fiber-like filler.
2. The conductive carbon fiber reinforced composite of claim 1, wherein the
carbonaceous fiber-like filler is modified with one of: a metal and a metal oxide.
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3. The conductive carbon fiber reinforced composite of claim 2, wherein the metal is
at least one of: silver, copper and nickel.
4. The conductive carbon fiber reinforced composite of claim 2 or claim 3, wherein
15 the carbonaceous fiber-like filler comprises one of: organo-silane functionalized
carbon fibers and metal-decorated organo-silane functionalized carbon fibers.
5. The conductive carbon fiber reinforced composite of claim 3, wherein the carbon
fibers comprise at least one of: single-walled carbon nanotubes, multi-walled
20 carbon nanotubes and thin multi-walled carbon nanotubes.
6. The conductive carbon fiber reinforced composite of any one of the preceding
claims, wherein percentage by weight of the carbonaceous fiber-like filler in the
nanocomposite resin ranges from 0.5% to 10%.
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7. The conductive carbon fiber reinforced composite of any one of the preceding
claims, wherein the conductive filler comprises particles of at least one of: metal
and metal oxide.
- 30 8. The conductive carbon fiber reinforced composite of claim 7, wherein the particles
comprise at least one of: nanoparticles and wire-shaped microparticles.
9. The conductive carbon fiber reinforced composite of claim 7 or claim 8, wherein
the conductive filler includes metal clusters.
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10. The conductive carbon fiber reinforced composite of any one of claims 7 to 9, wherein material of the conductive filler comprises at least one of: silver, nickel, copper and platinum.
- 5 11. The conductive carbon fiber reinforced composite of any one of the preceding claims, wherein percentage by weight of the conductive filler in the nanocomposite resin ranges from 0.5% to 20%.
- 10 12. The conductive carbon fiber reinforced composite of any one of the preceding claims, wherein weight ratio of the polymerizable thermosetting polymer to the conductive filler and to the carbonaceous fiber-like filler in the nanocomposite resin is 1 : 0.05 : 0.008.
- 15 13. The conductive carbon fiber reinforced composite of any one of the preceding claims, wherein the polymerizable thermosetting polymer comprises an epoxy polymer having a plurality of epoxide groups.
- 20 14. The conductive carbon fiber reinforced composite of any one of the preceding claims, wherein the metal-coated carbon fiber fabric comprises a woven carbon fiber fabric coated with a coating comprising at least one of: silver, nickel, copper, indium and gold.
- 25 15. The conductive carbon fiber reinforced composite of claim 14, wherein the coating has a thickness of up to 400nm.
16. The conductive carbon fiber reinforced composite of claim 14 or claim 15, wherein percentage by weight of the coating in the metal-coated carbon fiber fabric ranges from 1% to 30%.
- 30 17. The conductive carbon fiber reinforced composite of any one of the preceding claims, wherein percentage by weight of the metal-coated carbon fiber fabric in the conductive carbon fiber reinforced composite ranges from 65% to 75%.

18. A method of forming a conductive carbon fiber reinforced composite, the composite comprising a metal-coated carbon fiber fabric laminated with a nanocomposite resin, the nanocomposite resin comprising a mixture of: a polymerizable thermosetting polymer, a conductive filler, and a carbonaceous fiber-like filler, the method comprising the steps of:
- a) forming the nanocomposite resin;
 - b) forming the metal-coated carbon fiber fabric; and
 - c) laminating the metal-coated carbon fiber fabric with the nanocomposite resin using one of: a wet lay-up process followed by hot-press curing under vacuum, a vacuum infusion process, a prepreg fabrication process, and a resin transfer molding process.
19. The method of claim 18, wherein forming the metal-coated carbon fiber fabric comprises depositing a coating by electroless deposition of at least one of: silver, nickel, copper, indium and gold on a carbon fiber fabric.
20. The method of claim 18 or 19, wherein step a) comprises:
- i. dispersing the conductive filler in ethanol and stirring to form a first suspension,
 - ii. dispersing the carbonaceous fiber-like filler in ethanol followed by adding aminopropyltrimethoxysilane and followed by stirring to form a second suspension,
 - iii. adding the first suspension and the second suspension to the polymerizable thermosetting polymer to form a mixture,
 - iv. homogenizing the mixture,
 - v. removing ethanol from the mixture under vacuum,
 - vi. adding hardener to the mixture to form the nanocomposite resin, and
 - vii. degassing the nanocomposite resin.