



TECHNOLOGY SOLUTION

Manufacturing



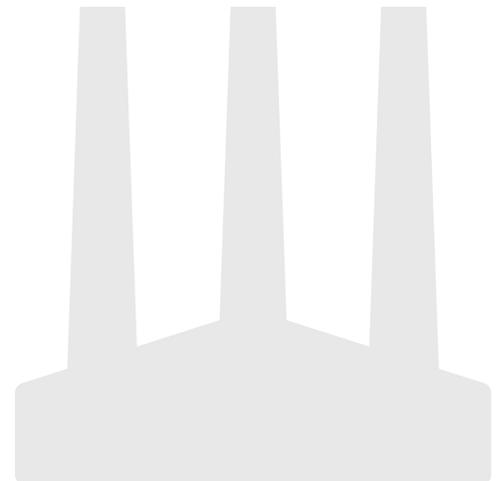
Free-Form Fabrication Using Electrically Conductive Filaments

A method for the free-form fabrication of articles out of electrically conductive filaments using localized heating

The use of multifunctional composites such as mechanically reinforced, electrically and thermally conductive parts is of interest in a range of application areas. Especially interesting and important is where tailorability of function is achieved by strategic placement of materials with unique functionality in locations that may not be accessible by conventional manufacturing techniques. Examples include embedded conductive paths interspersed in components to act as sensing elements, or as heaters, or to carry current to power to permit other components to be plugged in. The processing of these materials requires adhesion of filaments to each other, as well as to a substrate.

BENEFITS

- Confirms the viability of using a-C to form stable connections between BNNT using electron beam irradiation as a method of structural repair
- Mechanical properties of a-C joint on BNNT structures are comparable with those of currently available structural fibers such as CNT yarn, carbon fibers, and carbon fiber reinforced composites
- a-C welding represents an approach for transferring load between the tubes for future structural material designs



THE TECHNOLOGY

Free form fabrication of articles often requires the application of heat to melt the fabrication material feedstock, and controlled cooling to ensure that once the material is put into place, the fabricated structure does not suffer from distortion. Investigators at LaRC have developed a simple method to apply localized heat, by using an electrically conductive nozzle and a conductive plate as the electrodes for electrically conductive filaments. This method is intended to be used for laying down electrically conductive filaments in a fast, accurate and controlled manner with localized heat.



The technology could be used to develop lightweight armor. Image credit: Pixabay/parameciorecords

APPLICATIONS

The technology has several potential applications:

- Light-weight structural material for aerospace vehicles including high altitude and space exploration
- Neutron radiation shielding materials -- automobile, solar energy, cosmetics, clothing, blankets, helmets
- Military applications -- light weight armor
- Lightning protection for aerospace vehicles
- Flexible structural materials
- Highly conductive flexible materials for electrodes and supercapacitors
- Thermally conductive material applications
- Catalysts embedded in flexible membranes

PUBLICATIONS

Patent No: 10,894,353

National Aeronautics and Space Administration

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