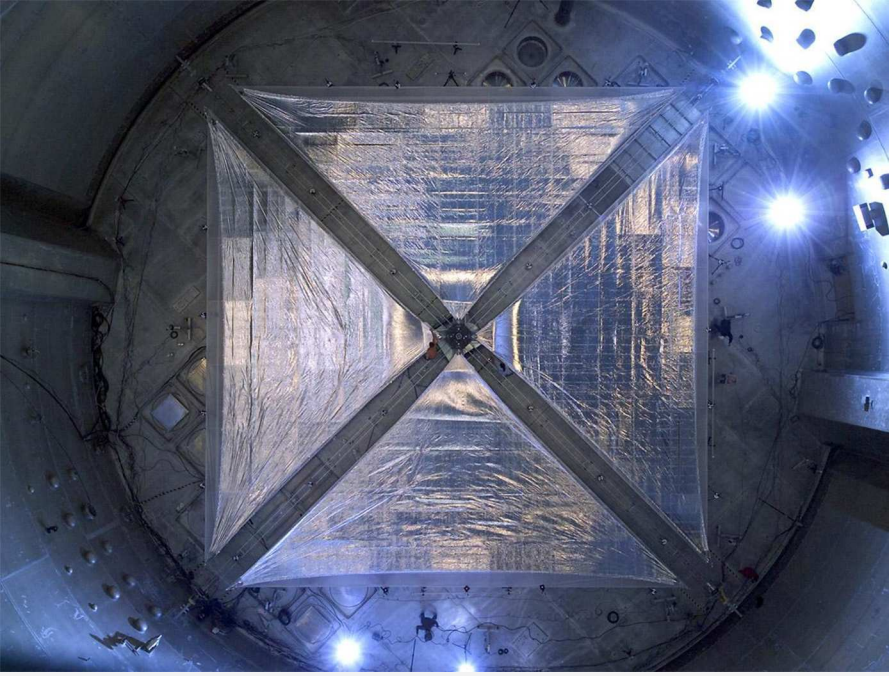

National Aeronautics and Space Administration

Materials and Coatings

Sequential/Simultaneous Multi-Metalized Nanocomposites (S2M2N)

Method to deposit nanoparticles via supercritical fluid multi-metal infusion

NASA Langley Research Center has developed a method to create Sequential/Simultaneous Multi-Metalized Nanocomposites (S2M2N) via supercritical fluid (SCF) sequential or simultaneous multi-metal infusion. The SCF infusion process provides deep impregnation of metal nanoparticles into a variety of materials, including those with challenging topographies and complex structures. The resulting multi-metallized nanocomposites can possess high electrical conductivity, permittivity, permeability, wear resistance/anti-penetrant, and radiation shielding along with high toughness. The technology has many applications, including for use on solar sails (pictured above).

BENEFITS

- No toxic solvents and contaminants
- Environmentally friendly
- Nanoparticles can decorate pre-resided nanotube (CNT, BNNT, GPs) or nanowire surfaces in a polymer matrix
- Effective in incorporating multiple functional nanoparticles into any porous structure (foams, aerogels, bucky papers, fabrics, and textiles) or complex structures
- Compared to other coating processes such as CVD and PVD, SFD depositions S2M2N offers deeper impregnation into the polymer and can accommodate challenging topographies

technology solution

THE TECHNOLOGY

Well-dispersed metal decorated nanotube or nanowire polymer composites have rarely been reported because of the excessive weight contrast between the decorated tubes and the polymer matrix. However, various properties, such as high electrical conductivity, permittivity, permeability, wear resistance, anti-penetrant, radiation shielding and high toughness are desirable and can be achieved with SeM2N metalized nanocomposites. Further, it is desirable to have nanocomposites that exhibit improvement in more than one of these properties and thus be capable of performing multiple functions. This invention provides a method to decorate pre-resided nanotube (CNT, BNNT, GPs) or nanowire surfaces in a polymer matrix with metal nanoparticles via supercritical fluid (SCF) deposition.

The invention can be utilized for lightning protection in aerospace vehicles. Image Credit: NOAA.

APPLICATIONS

The technology has several potential applications:

- Lightning protection for aerospace vehicles
- EMI shielding for aerospace vehicles, automobiles, and electronic devices
- Flexible organic magnet materials
- Highly conductive flexible materials for electrodes and supercapacitors
- Conductive and reflective solar sail gossamer structures
- Large scale deployable antennas which can manage EM signals in space
- Gas separation and filters
- Catalysts embedded in flexible membranes
- Gas sensors

PUBLICATIONS

Patent Pending

More Information

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NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

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