University of Texas at San Antonio

Department of Physics & Astronomy

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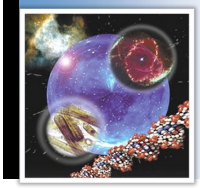
Time: 3:00 p.m.-4:00 p.m.

AET 0.214

Spinning the Unspinnable by Biscrolling Nanofiber Sheets and Functional Guests

Though yarn spinning has prehistoric origins and remains vital today, a host of important materials cannot be made into yarns by previously known methods. Generically applicable methods are demonstrated for producing continuous yarns comprising up to 99 wt % of otherwise unspinnable nanopowders or nanofibers that remain highly functional. These methods utilize the strength and electronic connectivity of sometimes minute amounts of carbon nanotube sheets that are helically scrolled in the yarns. Scrolled 50 nm thick nanotube sheet or sheet stacks can confine nanopowders, micropowders, or nanofibers in the corridors of often irregular scroll sacks, whose observed complex structures are related to twist-dependent extension of Archimedean or Fermat spirals or spiral pairs into scrolls. This new technology is used to make yarns of graphene ribbons, superconductors, high performance battery materials, catalytic oxygen electrodes for fuel cells, TiO_2 for release of active oxygen, and strong sutures containing biomedical agents. The observed mechanical properties enable yarn knotting and the weaving and sewing of biscrolled multifunctional yarns into textiles.



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