

**Topic:**

Advanced Green Composites

**Speaker:**

Prof. Anil N. Netravali, Jean and Douglas McLean Professor, Department of Fiber Science & Apparel Design, Cornell University

**Date:** 15 June 2016

**Time:** 2.30pm

**Venue:** Room ST602

**Abstract:**

Fiber reinforced 'advanced composites' are being increasingly used to replace metals in applications such as aerospace and automobiles because of their high mechanical properties and much lower density. Most high strength fibers and resins used in 'advanced composites' are derived from petroleum feedstock, a non-renewable resource that is expected to last only a few more decades at the current rate of consumption. With high production growth due to expanding applications of composites in the past few decades, their disposal at the end of their intended life has become difficult as well as expensive. Most of these composites end up in landfills. This presentation will discuss fully sustainable and environment-friendly 'green' composites made using yearly renewable plant based polymers such as proteins and starches and fibers that are carbon neutral. At the end of their life green composites can be easily composted. Green composites based on plant based proteins or starches and fibers developed by our group are suitable for use in packaging, housing or transportation panels, furniture, board sports and secondary structural applications. The presentation will also discuss Advanced Green Composites made using liquid crystalline cellulose fibers that have strength and toughness comparable to aramid fiber based composites. These advanced green composites may be used as primary structural elements and even for some ballistic applications.

**Biography:**

After obtaining PhD from North Carolina State University in 1984 Dr Netravali joined the Department of Materials Science and Engineering at Cornell University as a postdoctoral associate. In 1985 he joined the Department of Mechanical Engineering as a research associate and in August of 1987 he joined the Department of Fiber Science & Apparel Design as an assistant professor of Fiber Science. Currently he is the Jean and Douglas McLean Professor in Fiber Science & Apparel Design. His main research is in the field of Fiber Reinforced Composites and Green Materials and Processes. Within the composites area the primary focus of his group has been to develop sustainable and environment-friendly resins from plant-based proteins and starches and reinforcing them using plant-based fibers to fabricate Green Composites for a variety of applications. In the past few years, his research group has developed green resins and adhesives from a variety of proteins and starches that have excellent mechanical properties. These carbon-neutral alternatives for the conventional petroleum-based composites are fully compostable at the end of their life. His group has also made 'Advanced Green Composites' with high strength and toughness that may be used in structural and ballistic applications. The second focus of his group is modification of fiber surfaces to control fiber/resin interface characteristics in composites. His research group has used many

techniques including polymerizing and non-polymerizing plasmas, pulsed excimer laser, high power ion beam, solvent treatments, etc., to modify fiber surface chemistry and topography and controlling their adhesion to resins and thus the mechanical properties of composites. A third focus of his group is to develop new green nanofibers from proteins and starches for a variety of applications including high efficiency filtration and bacterial nanocellulose from food and agricultural waste for composites and medical applications. His research group is also involved in development of green processes for ultrahydrophobic and anti-wrinkle cotton and wool fabrics.

Dr Netravali is a member of the American Chemical Society, the Fiber Society and the American Nano Society. He is an Adjunct Professor at the Universidade Federal do Amazonas (UFAM), Manaus, Brazil, and the Department of Materials Science & Engineering at Tuskegee University, Tuskegee, AL. He is also a member of the Engineering Panel of the Research Grants Council (RGC) of Hong Kong. He serves on the Editorial Advisory Boards of six research journals; Composites Science and Technology (CST), Journal of Biobased Materials and Bioenergy (JBMBE), Journal of Renewable Materials (JRM), Reviews of Adhesion and Adhesives (RAA), Fibers, and Textile Research Journal (TRJ). He is a founding member and a member of the Advisory Committee of the International Workshop on Green Composites, a member of the International Scientific Committee for the Amazonic Green Materials and Processes Meetings as well as a member of the Scientific Committee. He is a Faculty Fellow at the David R. Atkinson Center for a Sustainable Future at Cornell University. He has published over 130 research papers and book chapters and co-edited 2 books.