seminars

Thursday 21st September 2017 12.00h

C/Faraday, 9
Conference Hall
Imdea Nanociencia
Ciudad Universitaria de Cantoblanco

Nanocellulose based functional materials

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Plant biomass or residues from forest-based industries can be isolated into nanosized cellulose (nanofibers and nanocrystals), following a top down approach. Due to the hierarchical (assembled) structure and semi-crystalline nature with alternating crystalline and non-crystalline domains of native cellulose, nanocellulose are produced with varying nanosized diameters, lengths, surface area and characteristics, mechanical properties etc. depending on the source, isolation methods and conditions (i.e. mechanical shearing and chemical actions). These nanomaterials possess unique characteristics like a high surface area of ≈170 m2/g with ≈1560 -OH groups per nanocrystal available for hydrogen bonding or other specific interactions and outstanding mechanical properties (Young's modulus of 130-250 GPa, tensile strength of 0.8-10 GPa). World over, the majority of the attempts to utilize these nanoparticles is in the form of nanoreinforcements in polymer matrices, where the nanoparticle dispersion is the crucial challenge. In the recent years biobased nanocrystals and nanofibers in the native and surface modified forms have shown tremendous potential in biobased membranes, biomedical products/implants, antifouling materials, insulating materials, energy devices etc. It may be argued new approaches to understand and exploit the inherent surface characteristics and high surface area of these biobased will generate the next generation of functional materials for the future.

Short bio

Dr. Aji. P. Mathew is a polymer chemist and Professor at the Division of Materials and Environmental Chemistry, Stockholm University, Sweden. She has a broad experience in the fields of cellulose nanocrystals, cellulose nanofibers, chitin nanocrystals and their nanocomposites. Her research work is focused on isolation of nano-reinforcements from different natural resources and their use as bio-nanocomposites, biomedical implants and water cleaning membranes, among others. She has extensive experience on processing of biobased nanocomposites by solution casting, twin-screw extrusion, two-roll mill mixing, electrospinning and melt-spinning. Characterization of bio*nanomaterials using mechanical testing, thermal analysis, atomic force microscopy, X-ray analysis and surface characterization are her areas of research interest. Prof. Mathew has published over one hundred peer–reviewed articles (H–Index 32), 16 book chapters and 7 edited books.

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