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## Colloidal crystal formation: Nano-dewetting and the assembly process

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Self-assembly of colloidal particles is a promising approach for fabrication of three-dimensional periodic structures which are especially interesting for photonic crystals. This approach is simple, cheap, and applicable for a large range of particles and lattice constants. However, these big advantages are accompanied by some drawbacks namely the imperfect control of the fabrication process and of the intrinsic defects. The type and the number of defects inside colloidal crystals are widely unknown and difficult to obtain from measurements. The efforts to improve the self-assembly process have led to many proposed deposition methods with a different degree of controllability and defect concentration. In this talk we will give the results for our deposition method. In addition, our studies have been devoted to understand colloidal crystal formation. Regarding one of the details of the formation process, we will have a closer look at the drying of colloidal crystals. This less-regarded but important step is connected with a continuous shrinkage process of the lattice. However, several minutes after starting the drying, the system seems to take a breath before it shrinks monotonously until its final state after about one day. This short period we call “v”-event because of the shape of the curve characterizing the lattice constant: a decrease followed by a counter-intuitive increase which ends after one hour. The event is found in time-dependent optical spectra. It is assigned to the start of a nano-dewetting process occurring at the colloidal particles.

### Biography

Frank Marlow has completed his PhD at the age of 28 years from Humboldt University Berlin and postdoctoral studies at the Institute of Applied Chemistry in Berlin, Delft University of Technology, and UC Santa Barbara. He is a group leader at the MPI für Kohlenforschung in Mülheim/Ruhr. He has published more than 100 papers in reputed journals.

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## Biorefinery: A molecular design platform for green surfactants and soft materials

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In future research, developing materials from renewable resources would be fascinating yet demanding practice, which will have a direct impact on industrial applications, and economically viable alternatives. This talk presents a novel and emerging concept of generating new chemicals, intermediates and materials in a ‘Biorefinery’. Our continuous efforts in this area have led us to develop new amphiphiles and surfactants from industrial by-products, which upon self-assembly produced molecular materials including micelles, emulsions, lipid nanotubes, twisted/helical nanofibers, thickening agents (molecular gels) and liquid crystals. More recently, harnessing the availability of ‘chiral pool’ of carbohydrates and selectivity of enzymes catalysis, we have produced an array of amphiphilic molecules from simple sugars and sugar alcohols. Intriguingly, by combining biocatalysis, with principles of green and supramolecular chemistry, we have developed building blocks-to-assembled materials. The second part of the talk addresses the templated synthesis of organic-inorganic hybrid materials for targeted use in coatings, liquid crystal templates and energy storage devices. These results will lead to efficient molecular design of supramolecular architectures and multifunctional soft materials from underutilized plant/crop-based renewable feedstock.

### Biography

George John is a Professor of Chemistry, the City College of the City University of New York (CUNY). After obtaining his PhD in Chemistry from Kerala University (worked at the Regional Research Laboratory (now NIIST), he held several research positions-in the Netherlands, Japan and at the Rensselaer Polytechnic Institute, Troy, New York before joining CUNY. The research in John’s laboratory is highly interdisciplinary and encourages blending of fields such as organic synthesis, green chemistry, material chemistry, colloid/interface science and biomimetics. The intriguing research has led to several high-impact original peer-reviewed articles in coveted journals; among them almost dozen publications were featured as cover page stories over the past seven years. The research has been widely highlighted by scientific publications (Nature, Science, Scientific American, Nature Materials, Nature Chemistry, C&EN ‘News of the Week’) and the media - The New York Times, Discovery News, Newsweek and MSNBC. He is on the editorial team of three international journals. He holds more than a dozen patents on inventions related to value-added chemicals/surfactants from renewable resources and biomaterials.

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