ULB

International Solvay Institutes Brussels

Vrije Universiteit Brussel

Solvay Colloquium

Professor Hiroshi Masuhara

National Chiao Tung University, Taiwan

Laser Light Can Crystallize Amino Acids and Proteins in Solution

Abstract

Laser has been contributing to the developments of various fields of science and technology since its invention in 1960 and one of its outstanding outcomes is to provide new concepts and methodologies for the next generation in science and technology. Indeed laser is very useful to explore novel light-induced phenomena, to analyze their dynamics and mechanism, and to develop new fabrication methods. Utilizing lasers and microscopes, we have devoted our efforts to advance molecular nanoscience and nanotechnology; (a) nano spectroscopy and photochemistry, (b) nano trapping and manipulation, and (c) nano ablation. Recently we have succeeded in demonstrating laser-induced crystallization and crystal growth of molecules in solution, which is reported and discussed in this Colloquium: (1) Crystallization and micro-seeding by femtosecond pulsed laser irradiation. Femtosecond laser excitation of aqueous solutions leads to its ablation at the focal point, inducing local microbubble formation, shockwave propagation, and convection flow. This laser bubbling phenomenon achieves crystallization of various molecules and proteins from their supersaturated solutions. Femtosecond laser ablation of single crystals in saturated solution forms their daughter crystals. The growth process was directly monitored for urea, while application to micro-seeding is developed for protein. (2) Crystallization by local heating due to steady state laser irradiation. Irradiation of gold thin film in saturated amino acid solution results in bubbling on which surface a dense liquid droplet was formed and followed by single crystal formation. (3) Crystallization and crystal polymorph control by laser trapping. Laser trapping of amino acid clusters at the air/solution interface evolves to its crystallization. Always one single crystal is prepared in a spatio-temporally controlled manner, and its crystal polymorph can be controlled by laser polarization and power. Upon irradiation at the glass/solution interface, a mm-sized dense liquid droplet is formed. This liquid-liquid phase transition is a precursory process before crystallization.

Tuesday 8 May 2012 at 4:00pm

COFFEE AND TEA WILL BE SERVED AT 3:45 IN FRONT OF THE SOLVAY ROOM

Ministère de la Communauté française

Wetenschap maakt knap – met de steun van de Vlaamse Regering

SOLVAY ROOM
UNIVERSITÉ LIBRE DE BRUXELLES
CAMPUS PLAINE - BUILDING NO - 5TH FLOOR
BOULEVARD DU TRIOMPHE - ACCESS 2
1050 BRUSSELS

belgacom

www.solvayinstitutes.be