

マテリアルサイエンス系セミナー(第3回)

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Guided hybrid stacking of carbon nanotubes and polymer crystalline lamellae

講演者: Associate Professor, Jrjeng Ruan, Department of Materials Science and Engineering, National Cheng Kung University

日時: 平成29年6月27日(火) 15:00~16:20

場所: マテリアルサイエンス系研究棟4棟8階 中セミナー室

講演要旨:

As an attempt to harvest the merits of ordered organization of inorganic/organic components within hybrid materials, the development of 3D networks of carbon nanotubes and conjugated polymers in solutions has been explored. When multiple liquid phases of polymers are present in solutions, the selective dispersion of carbon nanotubes within a favored liquid phase of semiconductive polymers has been identified to promptly occurs as being driven by favored interactions, which involves efficient self-assembly behavior of carbon nanotubes in solutions. The three-dimensional networks of polymer liquid phases thus serve as the association template of carbon nanotubes in solutions, assisting the formation of continuous dispersion pattern of carbon nanotubes.

The achieved 3D hybrid networks are able to be successfully preserved within thin film after solvent evaporation. Via selected annealing processes, the initiated crystallization is able to significantly adjust the dispersion of carbon nanotubes within selected networks. As the segregation of CNTs into amorphous regions is more efficient than the mutual aggregation of dispersed nanotubes, oriented intercalation of carbon nanotube bundles within order domains was found to evolve via the initiated stacking of crystalline lamellae of conjugated polymers, resulting in the spread of hybrid oriented arrays through thin films.

Furthermore, this template of liquid phase networks is also illustrated to induce the self-assembly of graphene sheets and phenyl-C61-butyric acid methyl ester (PCBM). During controlled advancement of crystallization, the networks of graphene and single crystalline platelets of PCBM are able to develop in thin films. According to these preliminary successes, the dispersion of polymer liquid phases and stacking of crystalline lamellae are clarified as helpful approaches to widely develop two-dimensional organic/inorganic hybrid stacking arrays.

講演者略歴:

Prof. Jrjeng Ruan received the Ph.D. degree in 2003 from the University of Akron, department of polymer science, OH, USA, under the instruction of Prof. Stephen Z. D. Cheng. Afterward, he worked as a postdoctoral fellow with Dr. Bernard Lotz in CNRS, France for two years for the study on polymer crystallization. He is currently an Associate Professor at the Department of Materials Science and Engineering, National Cheng Kung University (NCKU), Tainan, Taiwan.

Prof Ruan's research interests are mainly about polymer physics, growth mechanisms of order structures within materials, ordering behaviors of molecules, as well as the relationships between molecular organization and materials properties. For deciphering materials structures of various scales, the experiences and knowledges of using wide-angle diffraction and small-angle scattering techniques have been accumulated. The recent research effort of Prof. Ruan is devoted to the exploration of functional nanostructures within organic/inorganic hybrid materials as an attempt to clarify the relationships between organization of molecules and the performance of organic optoelectrical devices, like organic field-effect thin-film transistors and solar cells.

参加申込・予約は不要です。直接会場にお越しください。

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