Title: Emergence of Hierarchical Morphologies in Binary Blends of Diblock Copolymers

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URL: http://pirsa.org/13120025

Abstract: The self-assembled structures formed in binary blends of AB/CD diblock copolymers are studied using self-consistent field theory focusing on cases with attractive A/C and repulsive B/D interactions. The attractive A/C interaction prevents macroscopic phase separation whereas the repulsive B/D interaction promotes B/D separation leading to the formation of complex hierarchical structures. The combination of these features makes the AB/CD blend an ideal model system for the study of hierarchical self-assembly. Our results demonstrate that the B/D separation leads to the emergence of modulated and alternate morphologies from the classical lamellar hexagonal spherical and gyroid structures. A common phase transition sequence from the mixed to modulated to alternate B/D structures is observed as a function of B/D interaction strength. The theoretical predictions of our model are consistent with available experiments and more importantly provide an interesting route for the engineering of hierarchically ordered structures using block copolymer blends.

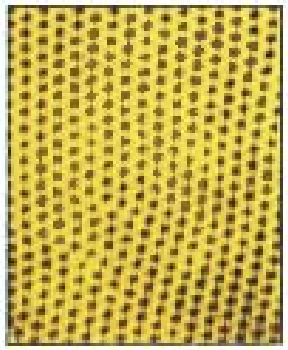
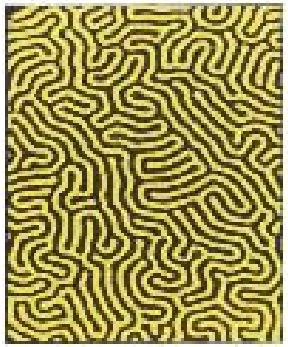
Emergence of Hierarchical Morphologies in Binary Blends of Diblock Copolymers

Ashkan Dehghan[1], Weiquan Xu[2], Pingwen Zhang[2] and An-Chang Shi[1]

1 Department of Physics and Astronomy, McMaster University, Hamilton, Ontario, Canada

2 School of Mathematical Sciences, Peking University, Beijing, China

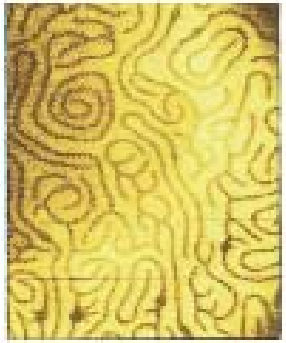
Pattern Formation:

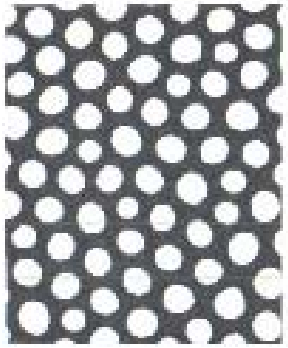
Ferrofluid

Polymers

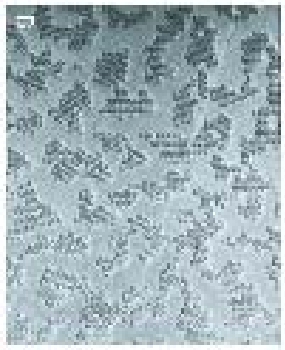
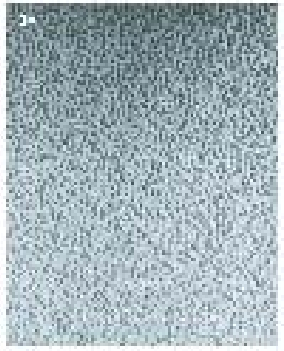
Organic Films



Polymers



Magnetic garnet films

Colloids

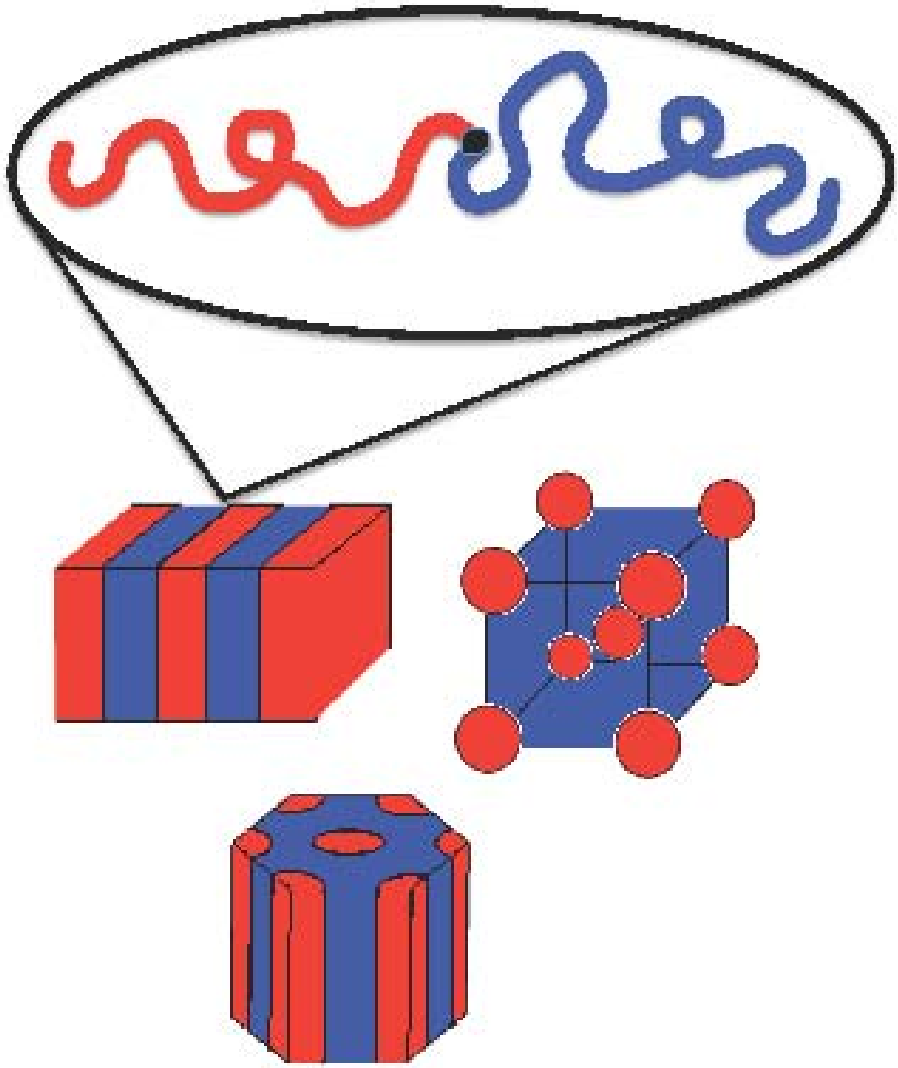
http://physics.nyu.edu/grierlab/surface14c/

Seul, Michael, and David Andelman. "Domain shapes and patterns: the

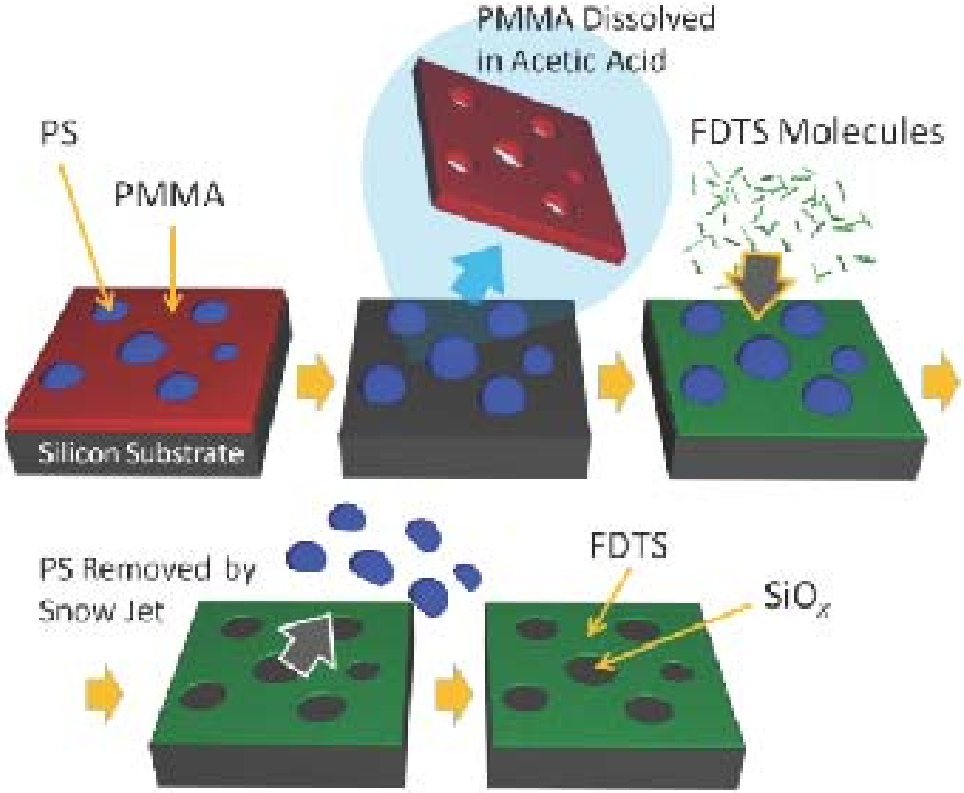
Observation of Cylinder-Based Microphase-Separated Structures from ABC Star-Shaped Terpolymers Investigated by Electron Computerized Tomography

A. Takano,†,‡,‡,,S. Wada,‡,S. Sato,†, T. Araki,†, K. Hirahara,†, T. Kazama,†, S. Kawahara,†,

Self-Assembly in Polymers:

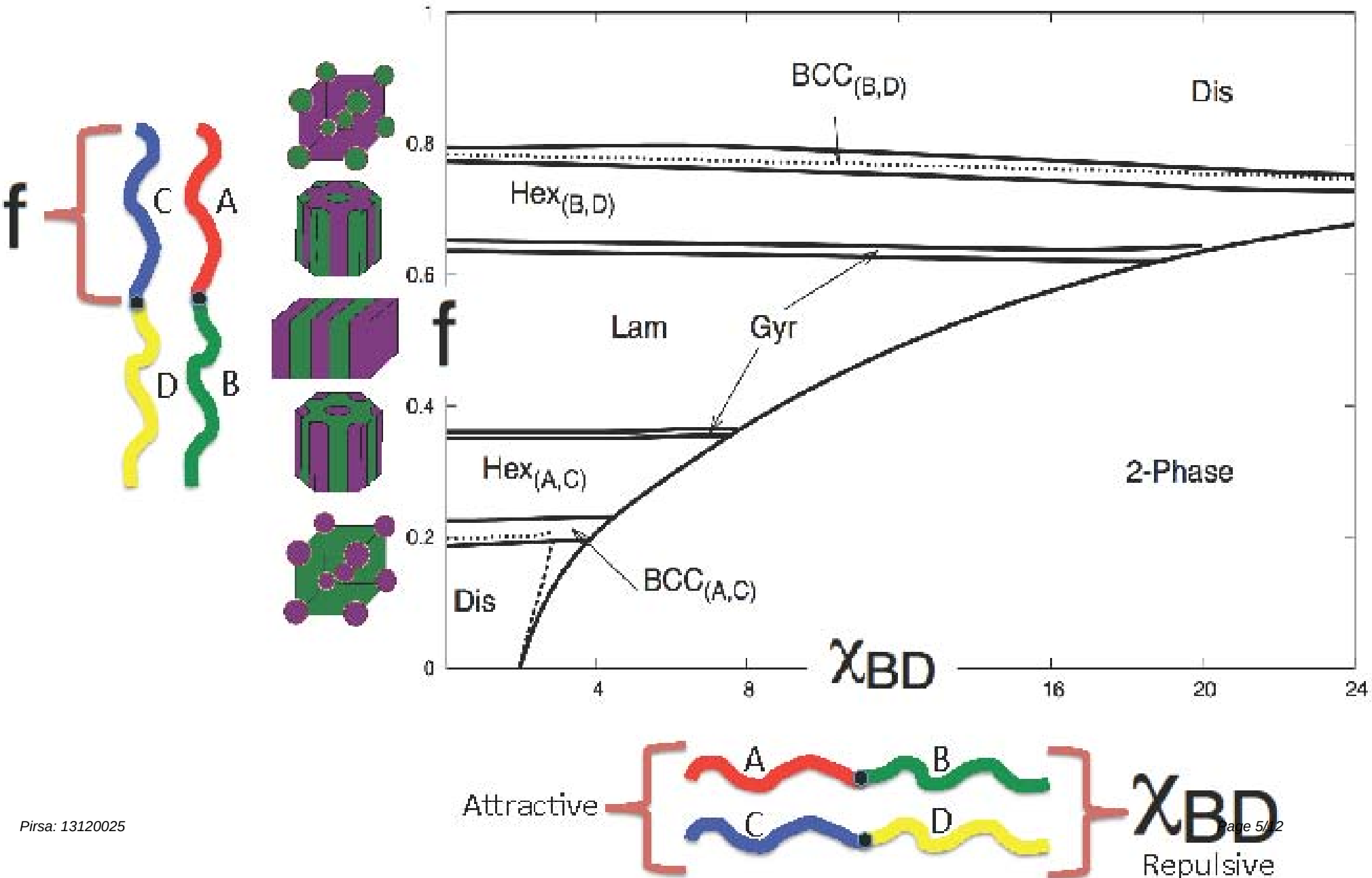


Lithography



Cheng Huang[1,2], Markus Mossmann[1], Jiehong Jin[1], Tobias Heiler[1], Stefan Walheim[1] and Thomas Schimmel[1,2]
[1]Institute of Nanotechnology (INT), Karlsruhe Institute of Technology (KIT), 76021 Karlsruhe, Germany
[2]Institute of Applied Physics and Center for Functional Nanostructures (CFN), Karlsruhe Institute of Technology (KIT), 76128 Karlsruhe, Germany
(Joint Research Laboratory Nanomaterials, Karlsruhe Institute of Technology (KIT), Germany)

AB/CD Diblock Copolymers:



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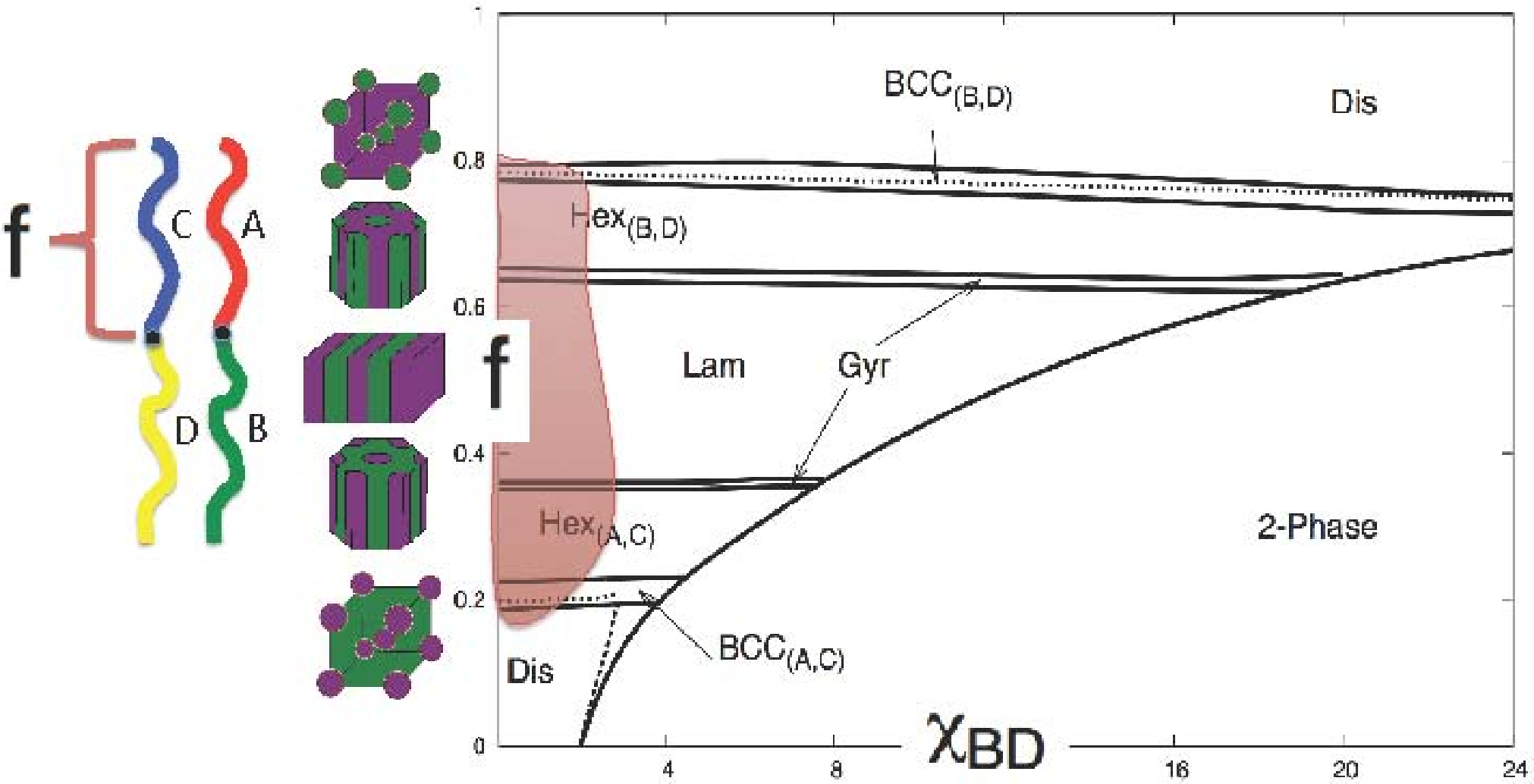

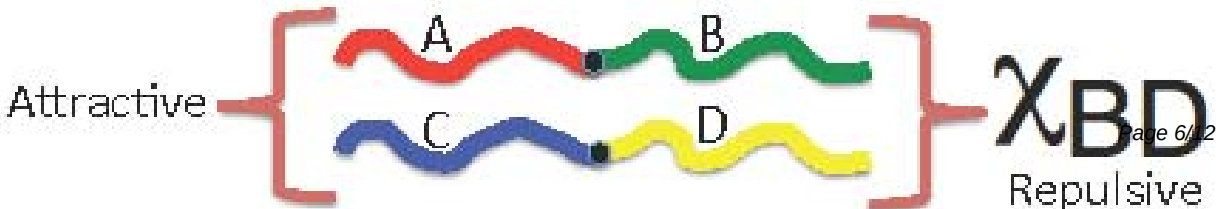

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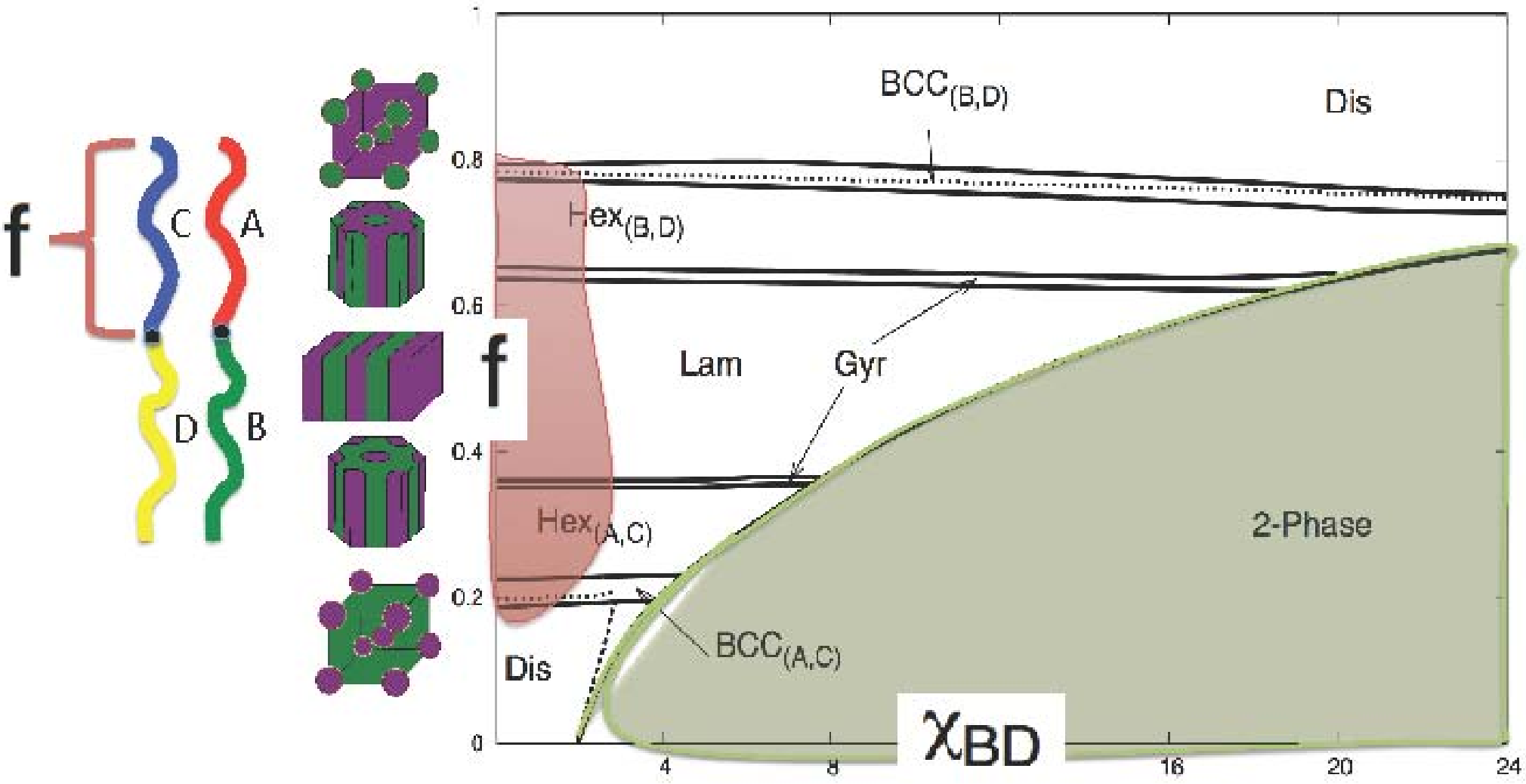

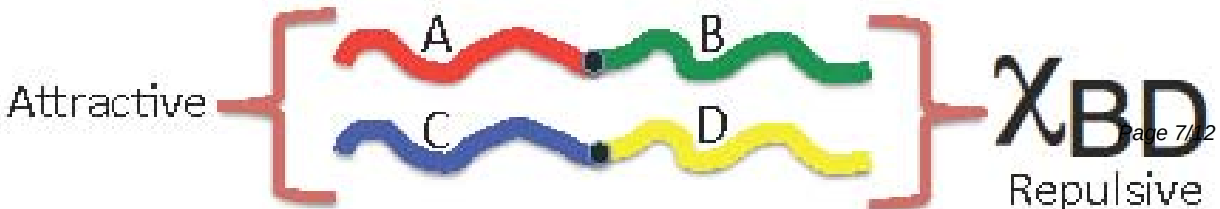

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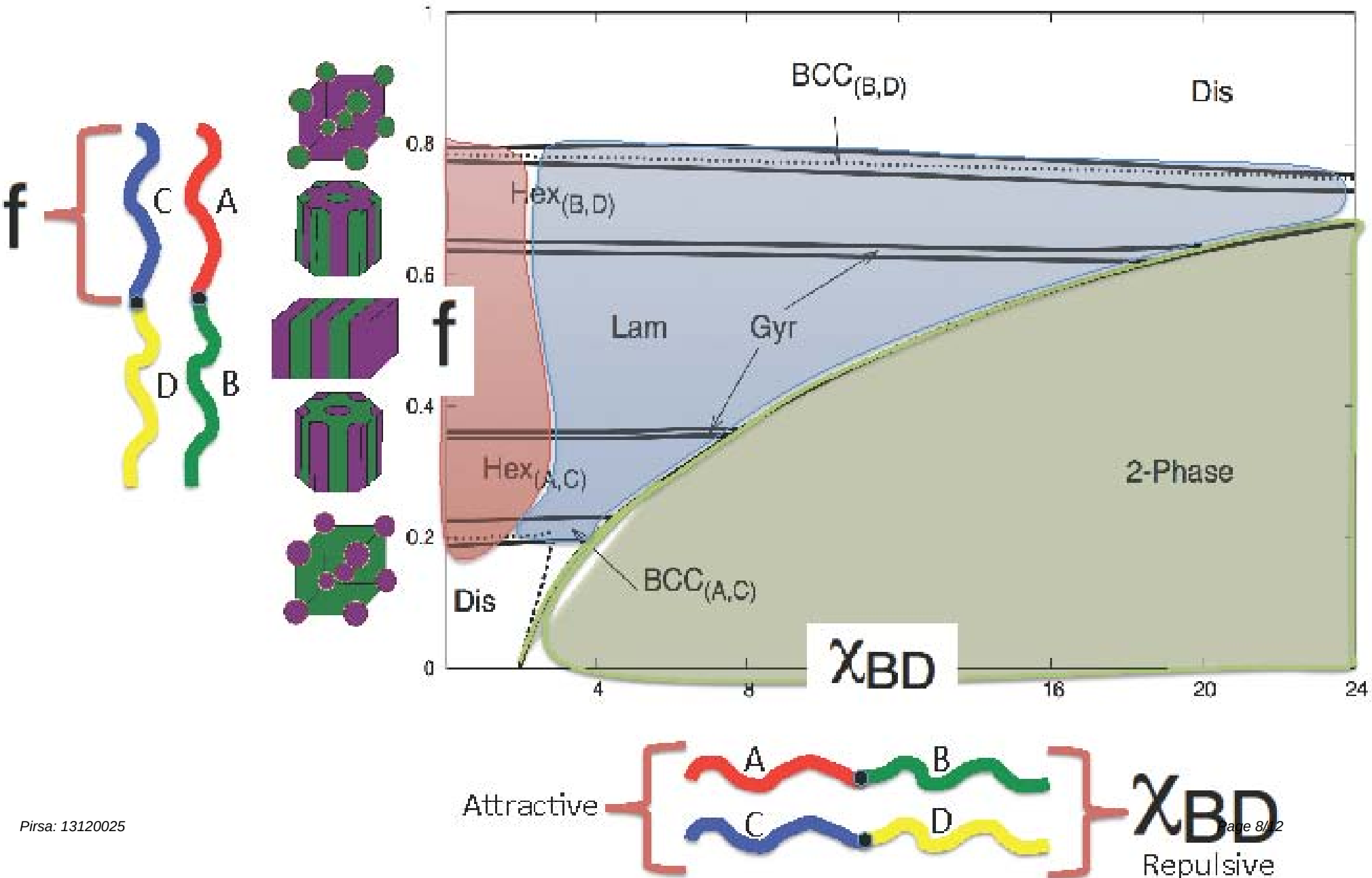
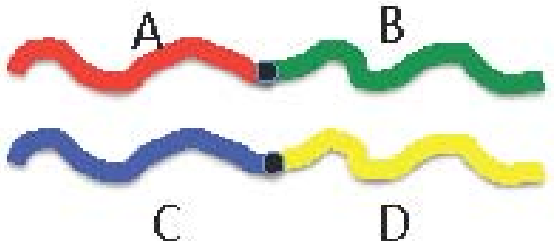
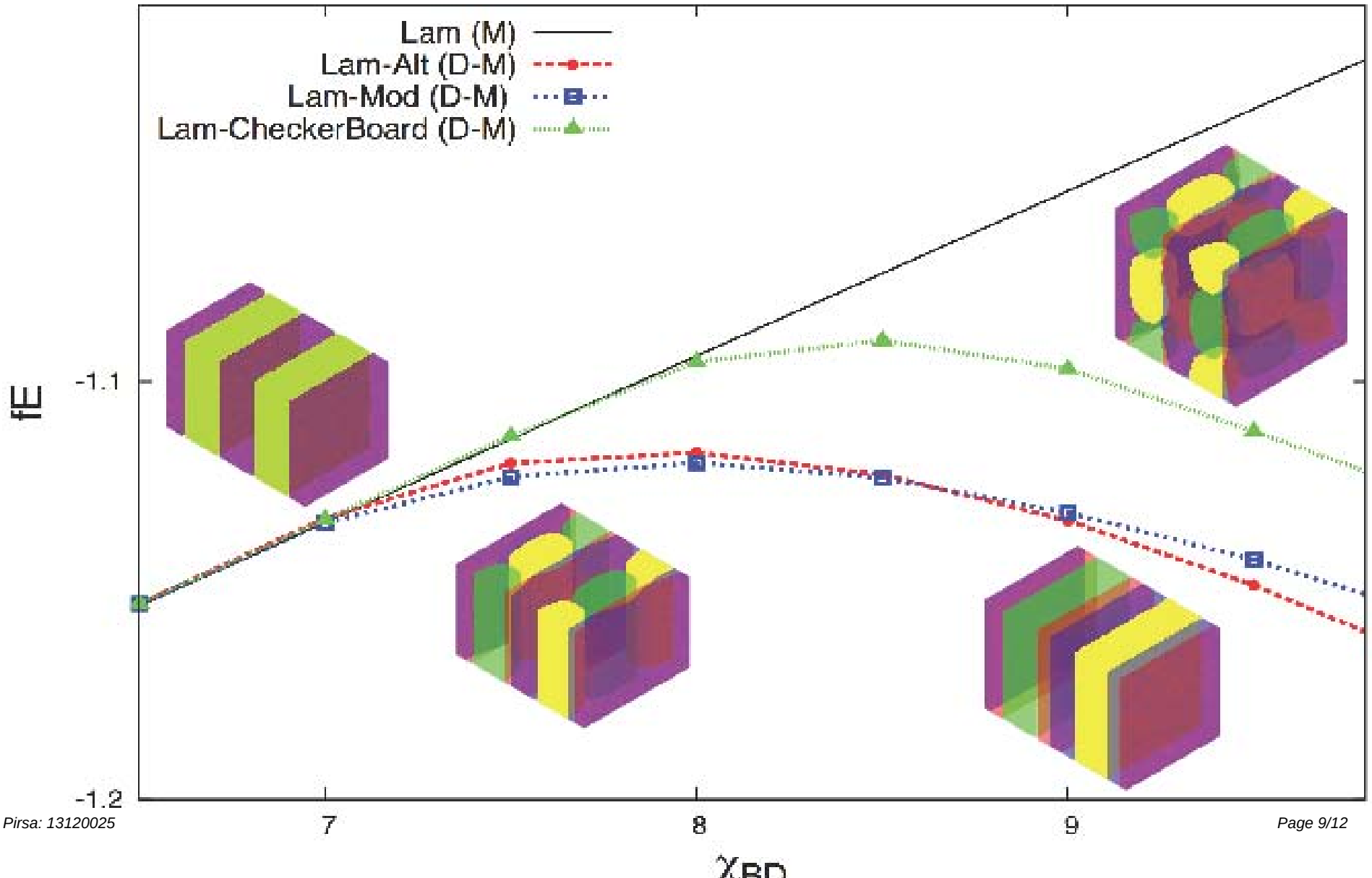
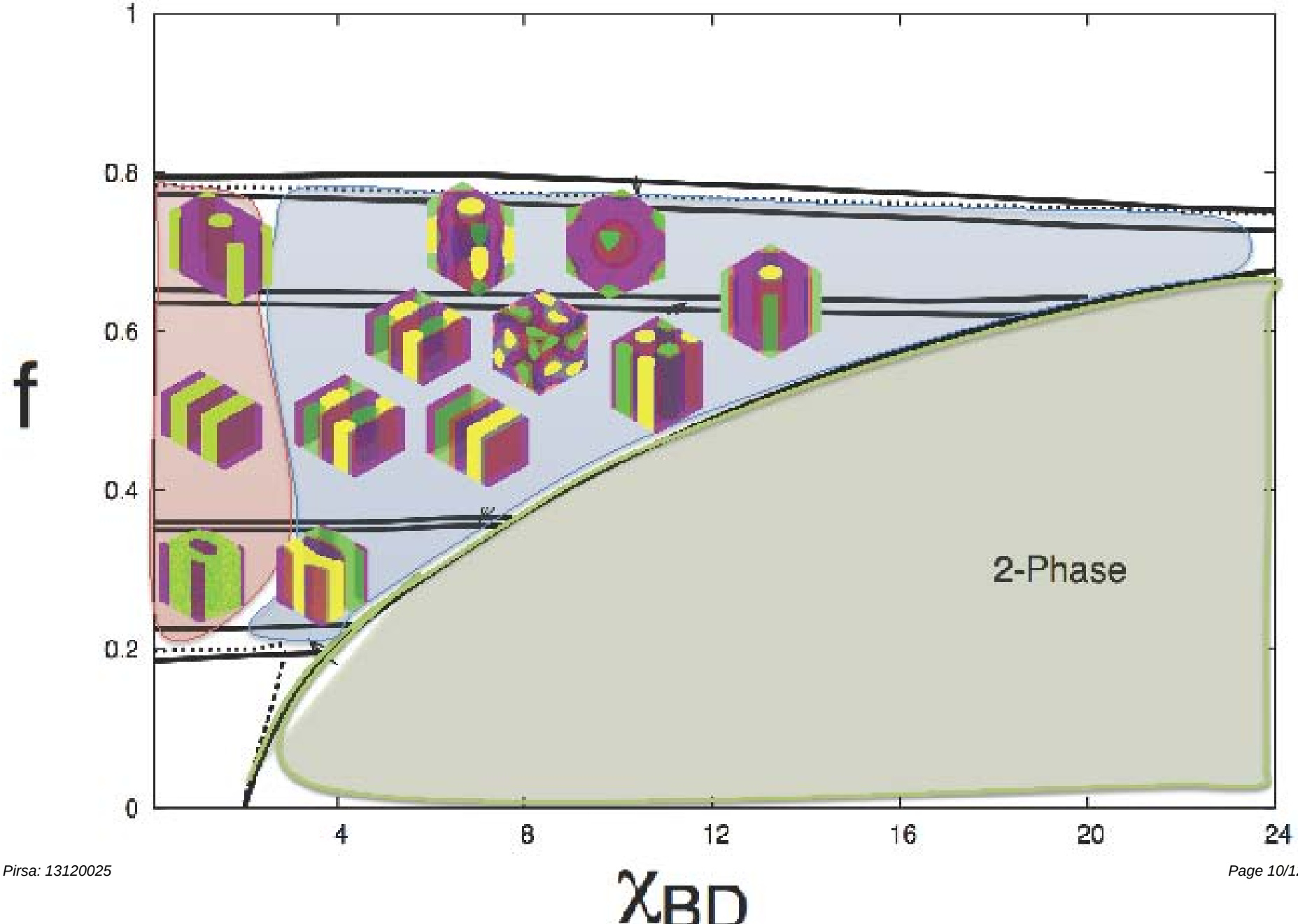


Discovering New Structures:

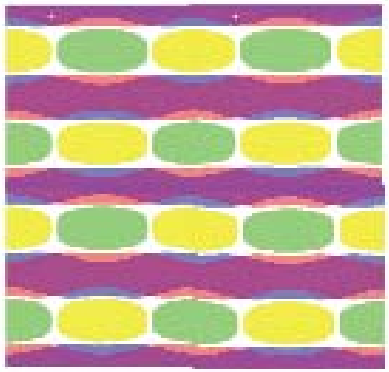


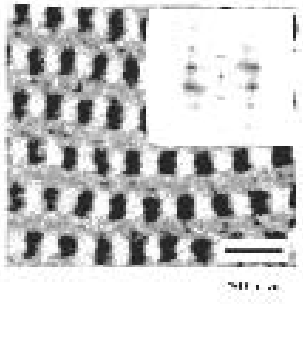


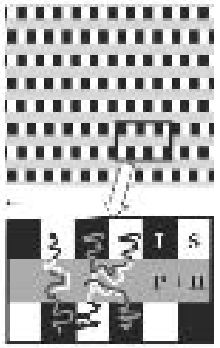
Revisiting the phase behavior:

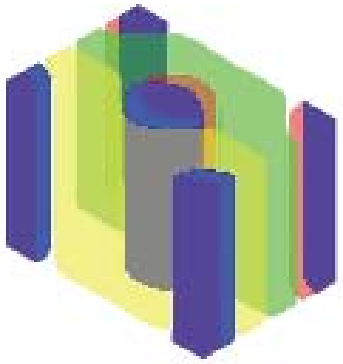


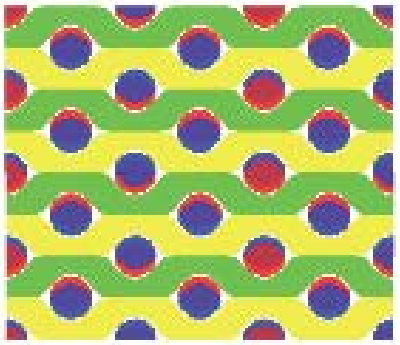
Discovering New Structures:

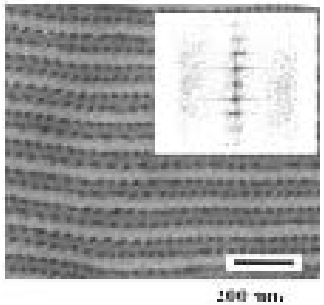


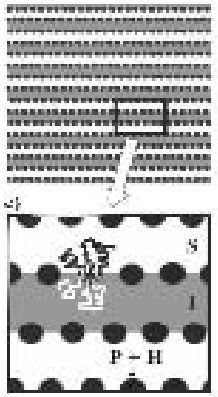


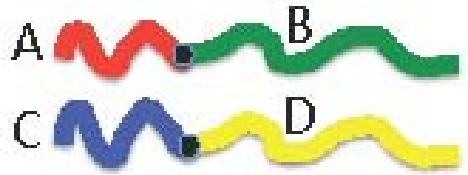












Three-Phase Hierarchical Structures from AB/CD Diblock Copolymer Blends with Complemental Hydrogen Bonding Interaction
Takeshi Asari,† Shigeo Matsuo,‡ Atsushi Takano,‡ and Yushu Matsushita*
Macromolecules 2005 38 (21), 8811-8815

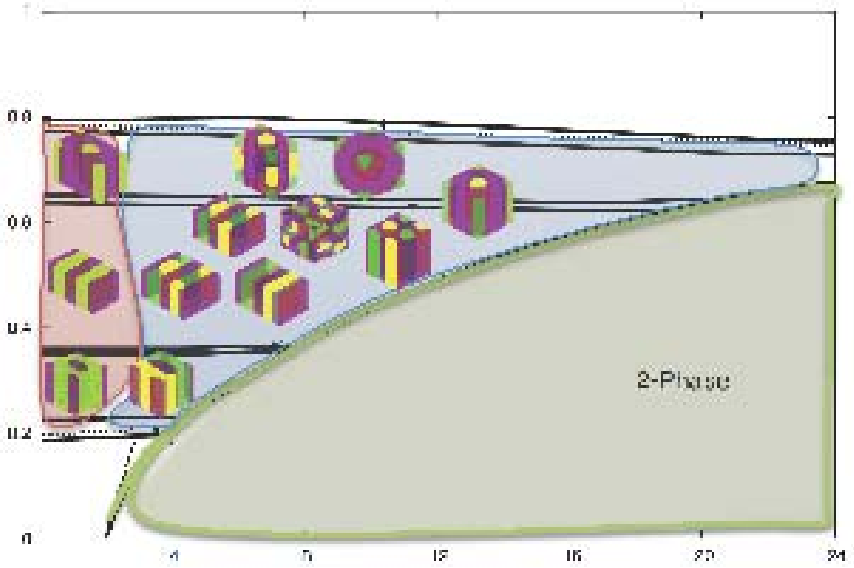
Thank You

Collaborators:

Weiquan Xu

Pingwen Zhang

An-Chang Shi



Resources:

Compute Canada

SHARCNET

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