Introduction to

Polymer Physics

Syllabus

Text:
"An Introduction to Polymer Physics" (David I. Bower) Cambridge Univ. Press (2004)

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강의조교	유귀덕, 박나리		상담시간	금요일 오후 4-5시	

Solid state materials

- Organic vs. Inorganic materials

  -specific features of each materials?

- Crystalline vs. Amorphous materials

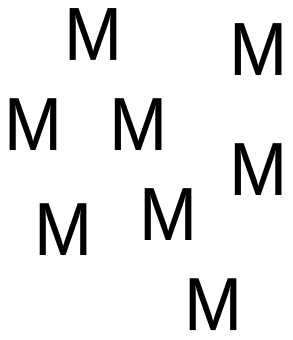
  -difference in thermodynamic or kinetic phenomena?

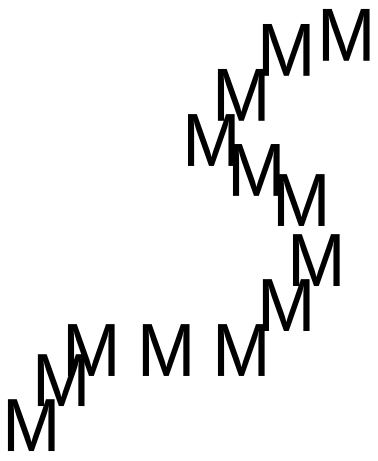
  -how can we observe the difference?

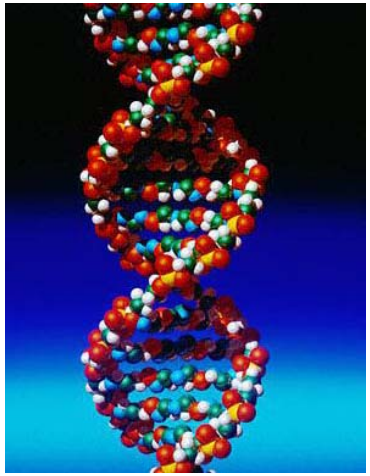
Physical structure of polymers

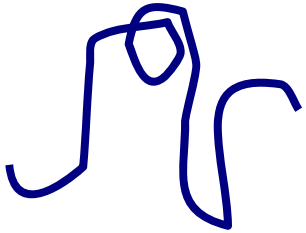
- amorphous
- (semi)crystalline
- rubber
- solution
- melt

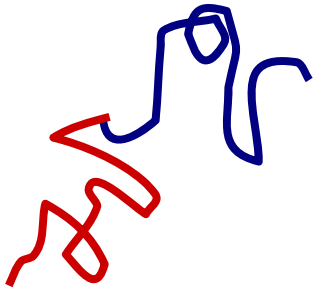
Small vs. large molecules









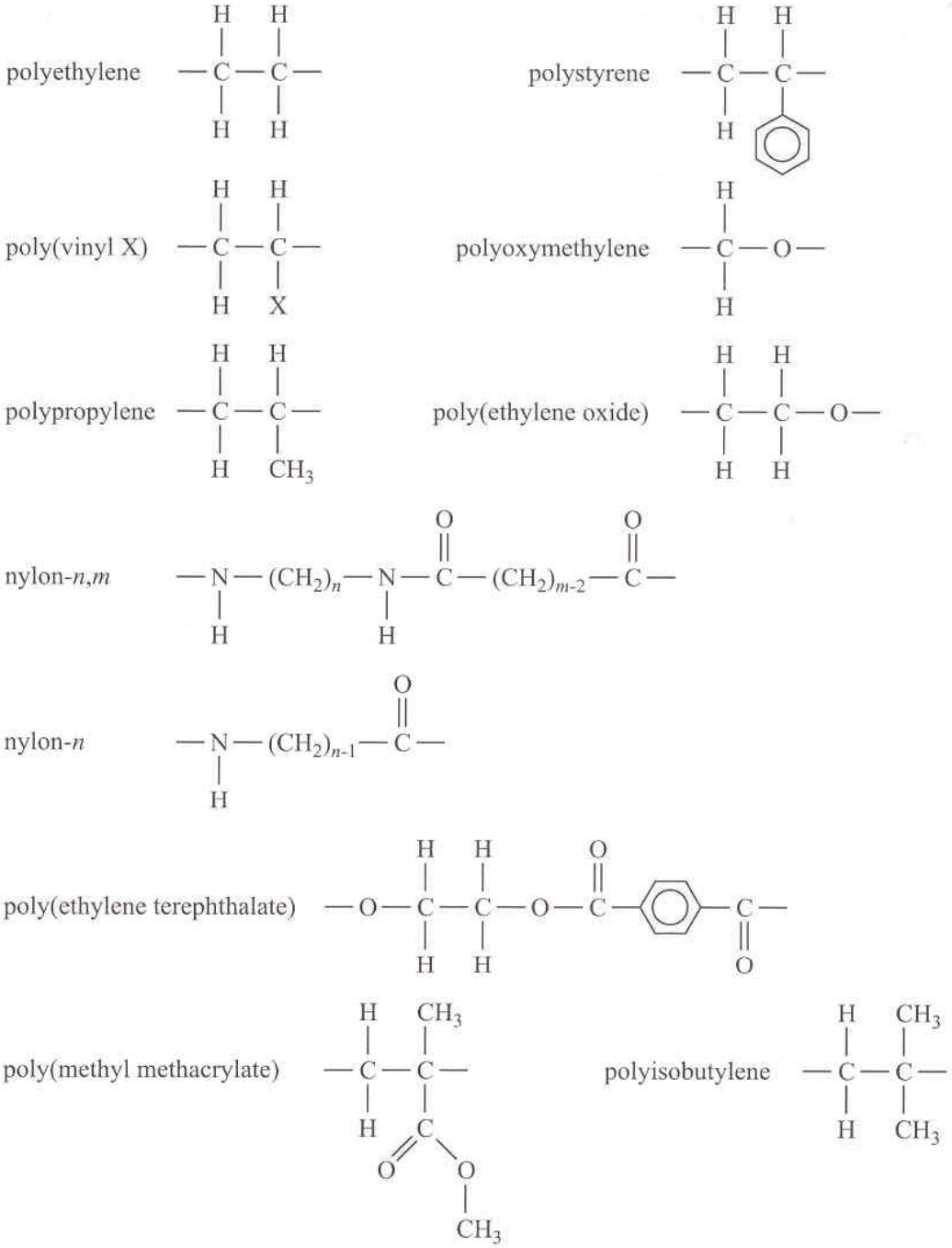


monomer

Polymer

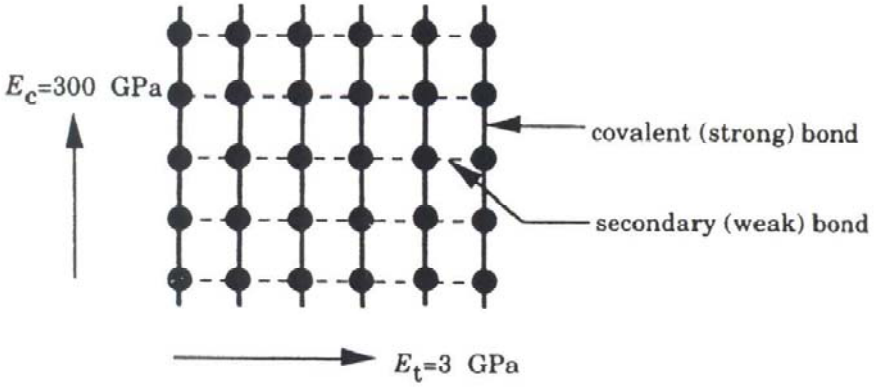
Macromolecules

Fig. 1.2 Structures of the repeating units of some common polymers.



Molecular features

- chain molecule
  - primary (covalent) bonding ~ along the chain
  - secondary interaction ~ between the chains
  - entanglement



(fully-extended) crystal

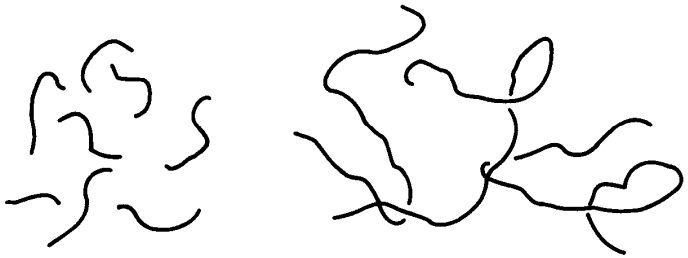


Figure 1.3 Entanglement of polymer chains. (*a*) Low molecular weight, no entanglement. (*b*) High molecular weight, chains are entangled. The transition between the two is often at about 600 backbone chain atoms.

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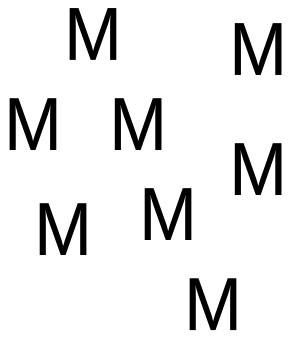
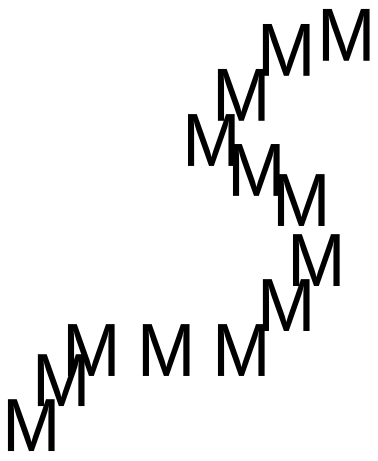
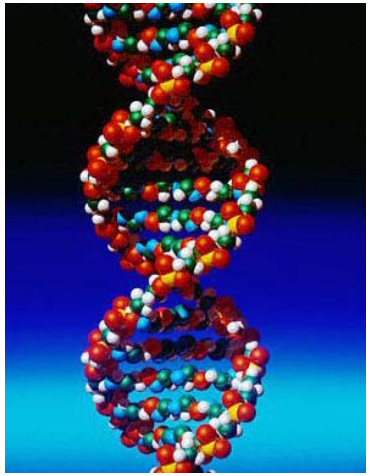
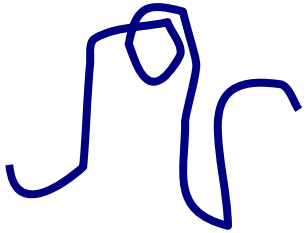
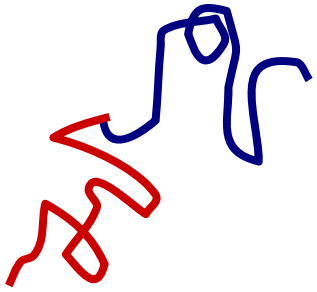
Small vs. large molecules











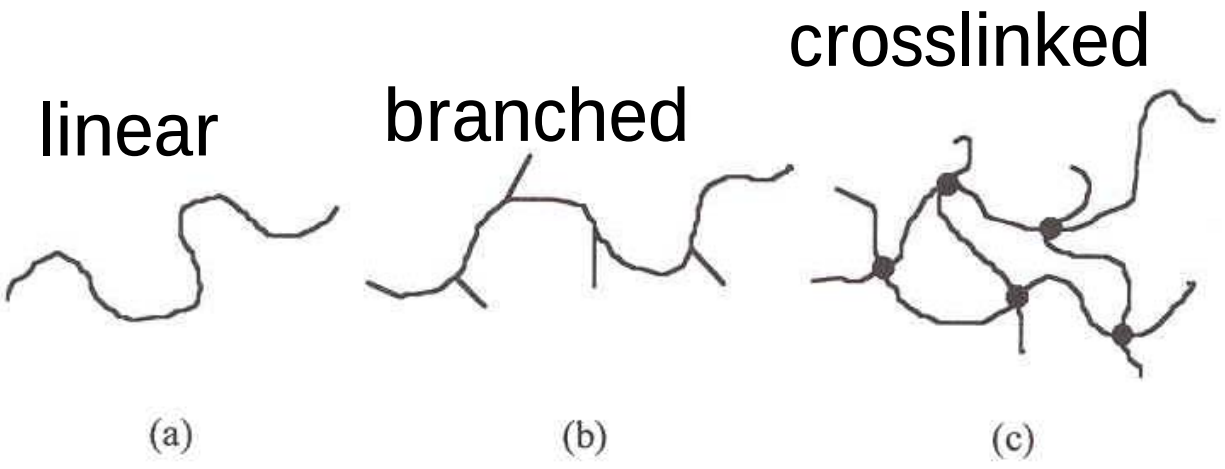
monomer

Polymer

Macromolecules

Molecular architecture

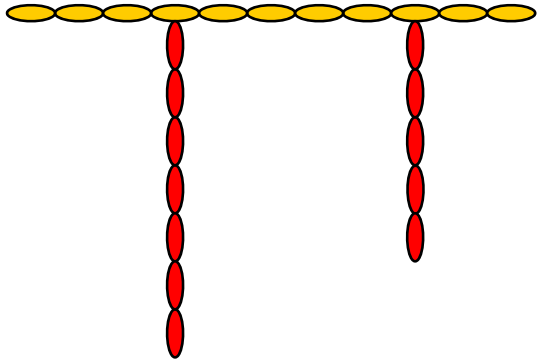
Fig. 1.3 Schematic representations of (a) a linear polymer, (b) a branched polymer and (c) a network polymer. The symbol • represents a cross-link point, i.e. a place where two chains are chemically bonded together.



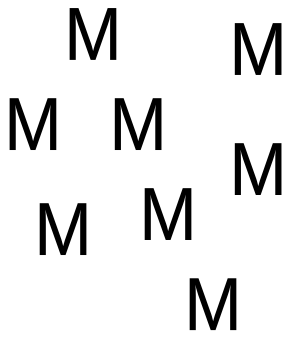
dendrimer,
hyperbranched

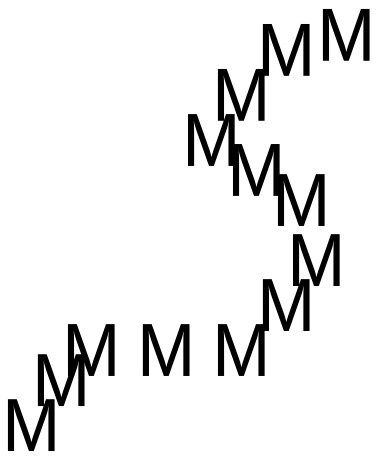
ladder

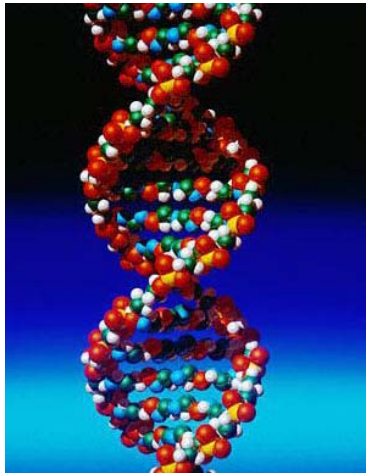
Copolymers

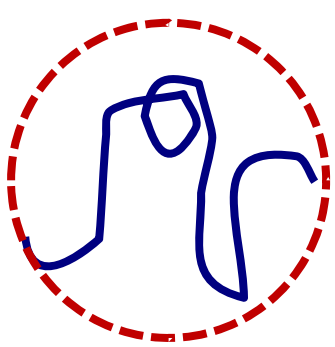
- homopolymer 
- copolymer
  - statistical (random) copolymer 
  - alternating copolymer 
  - block copolymer 
    - diblock, triblock, multiblock
    - symmetric, asymmetric
  - graft copolymer 

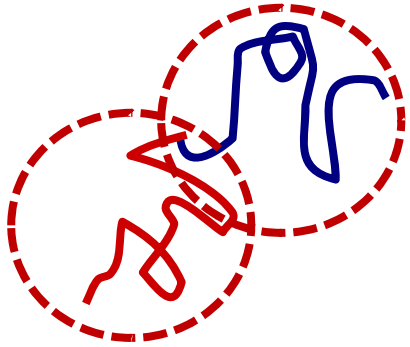
Small vs. large molecules











monomer

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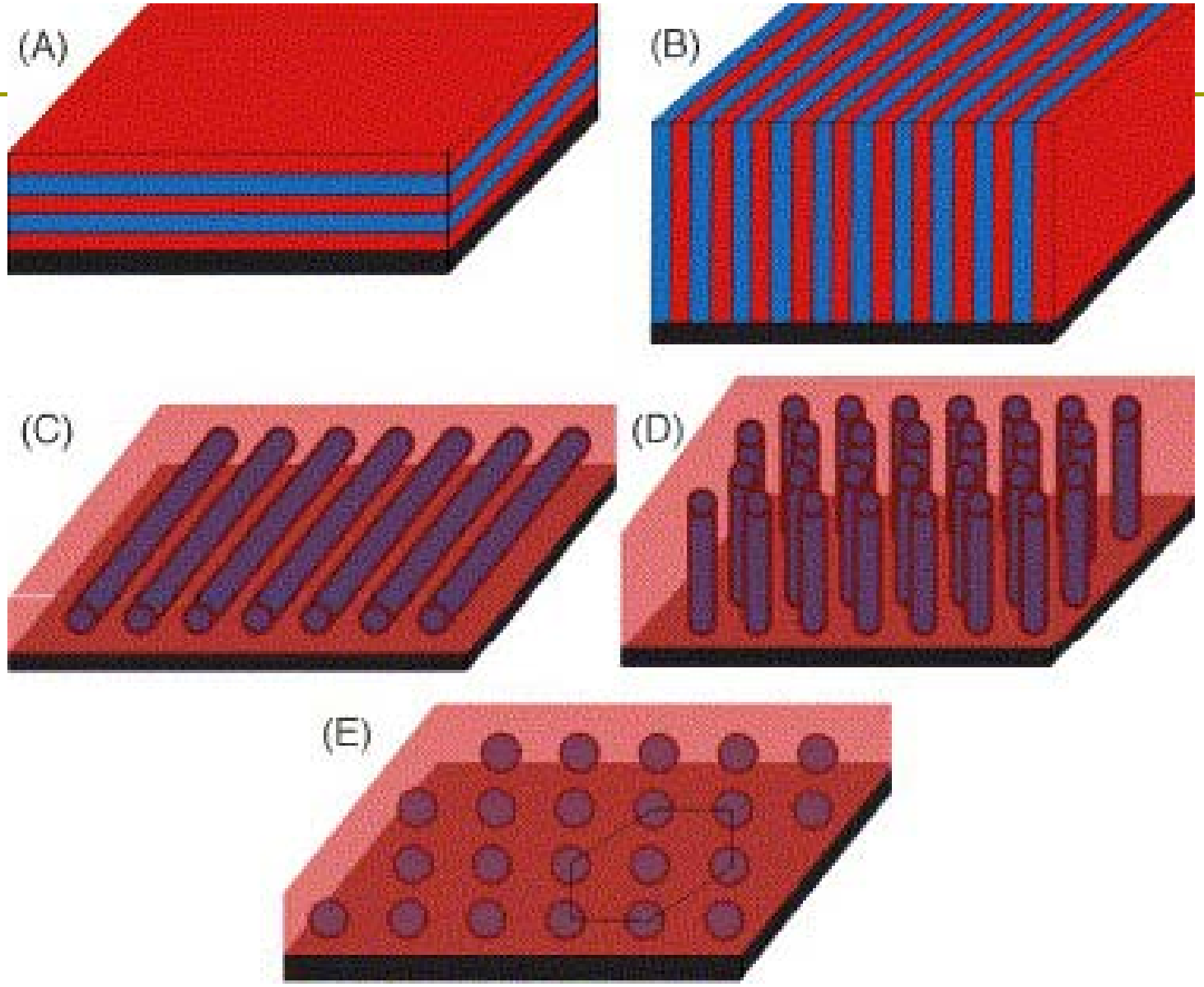
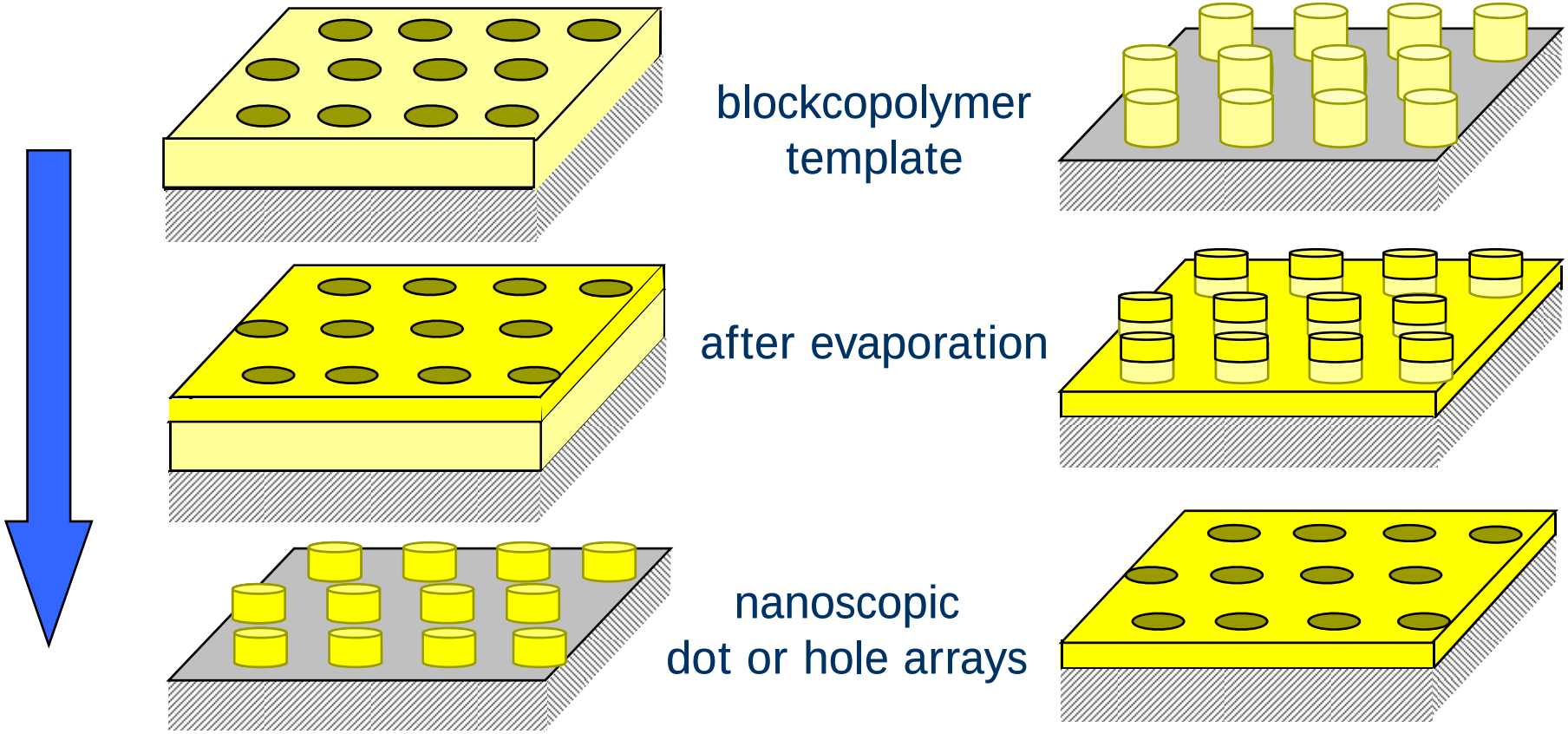
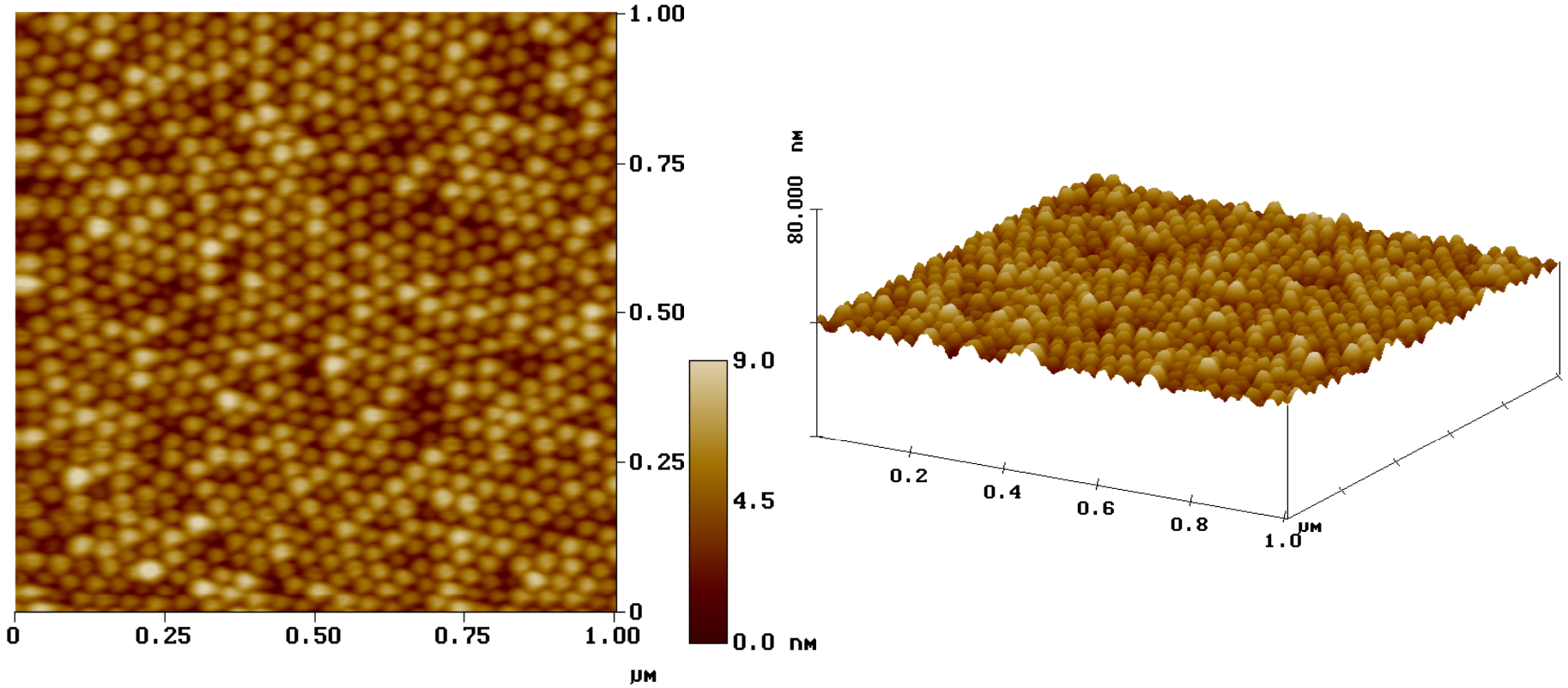

(A)
(B)
(C)
(D)
(E)

Ultrahigh-density nanostructures



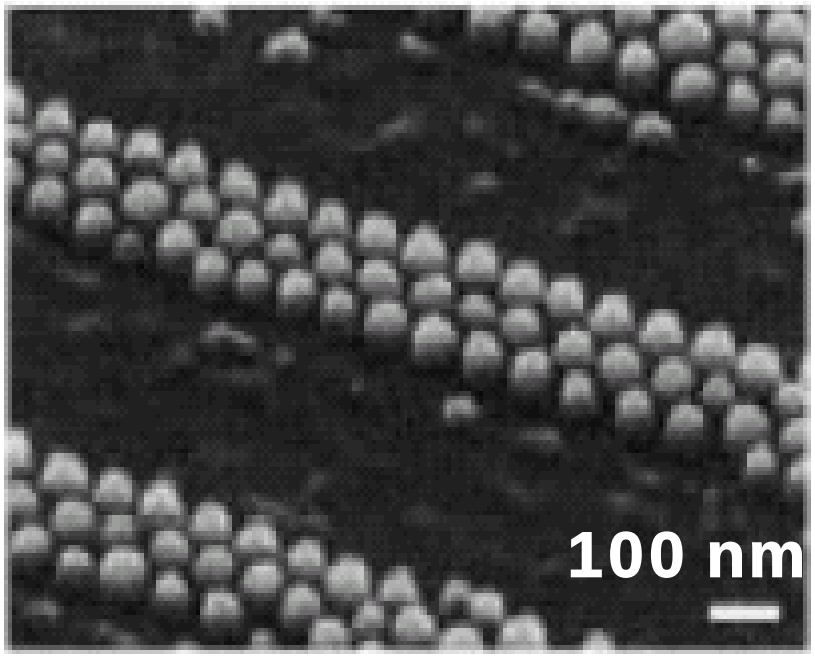
Metallic nanodot arrays

- Metallic nanodot arrays



Shin et al., Nano Lett. (2002)

Recording media
using self-assembled diblock copolymer templates



Patterned CoCrPt

the patterned media disk on a 2.5-inch HDD glass plate

IEEE TRANSACTIONS ON MAGNETICS, VOL. 38, NO. 5, SEPTEMBER 2002