2007년 한국화학공학회 이동현상부문위원회 세미나 안내

1. 주제 : 이동현상에서 나노과학과 나노기술

2. 일시 : 2007년 11월 17일(토) 14:00 - 18:00

3. 장소 : 서울대학교 화학공정신기술연구소 3층 세미나실

4. 일정 :

- 13:45 - 14:00 등록 및 인사말씀
  임교빈 교수(이동현상부문위원회 위원장)

- 14:00 - 15:00 신규순 교수(서울대학교 화학생물공학부)
  "Polymers in nanopores"

- 15:00 - 16:00 류원선 교수(홍익대학교 화학공학과)
  "Electorophoresis of colloids in low-dielectric medium of supercritical carbon dioxide"

- 16:00 - 17:00 김영훈 교수(광운대학교 화학공학과)
  "Dependence of Approaching Velocity on the Force-Distance Curve in AFM Analysis

- 17:00 - 17:30 이동현상경시대회 수상자(장려상) 시상

- 17:30 - 폐회 및 간친회

5. 후원 : 서울대학교 화학생물공학부 BK사업단

6. 문의 : 한국화학공학회 이동현상부문위원회(윤도영교수, 011-392-8394)

제목	Polymers in Nanopores
요약	The state-of-art research on various behaviors of materials in nanoscopically confined geometry is now being shifted from planar films to other geometry such as cylindrical nanopore. While we focused on the physical properties of polymer under curved constraint during the recent years, we found some examples where frustration, induced by curvature, breaks the symmetry of a structure. With diblock copolymers, for example, when the extreme imposed curvature comparable to molecular dimensions, coupled with commensurability conditions, places significant packing constraints on the chains, it induces a new morphology that cannot be observed in bulk. Crystal structure of a crystalline polymer was also found to be controlled by the imposed curvature in a nanoscopic cylindrical pore. In addition, crystallization behavior in the cylindrical nanopore is drastically altered upon tightening the degree of confinement from homogeneous to heterogeneous nucleation mechanism. Crystalline materials in such confined geometry often offer many useful and innovative properties that cannot be expected in bulk materials, and therefore the understanding of confined crystallization is of supreme importance for the designing a new type of crystalline materials that show unique properties. When the dimensions of a confining volume are much less than the radius of gyration, a quantitative understanding of perturbations to chain dynamics due to geometric constraints remains a challenge and, with the development of nanofabrication processes, the dynamics of confined polymers have significant technological implications. In this presentation, we will describe a weak molecular-weight dependent mobility of polymers confined within nanoscopic cylindrical pores having diameters smaller than the dimension of the chains in the bulk. On the basis of the chain configuration along the pore axis, the measured mobility of polymers in the confined geometry is much higher than the mobility of the unconfined chain. With the emergence of nanofabrication processes based on polymer flow, the unexpected enhancement in flow and reduction in intermolecular entanglements are of significant importance in the design and execution of processing strategies.

연사 신규순 교수(서울대학교 화학생물공학부)

2005. 9 ~ 현재	서울대학교 화학생물공학부	조교수
2005. 9 ~ 2007. 10	서울대학교 화학생물공학부	전임강사
2003. 7 ~ 2005. 6	UMASS Amherst	Post doc
1997. 3 ~ 2003. 2	서울대학교/응용화학부	응용화학 (박사)
1995. 3 ~ 1997. 2	서울대학교/공업화학과	공업화학 (석사)
1991. 3 ~ 1995. 2	서울대학교/공업화학과	공업화학 (학사)

(최종학위논문명)
계면자유에너지를 고려한 폴리에틸렌 랜덤공중합체 및 블렌드의 용융 열역학

제목	Electorophoresis of colloids in low-dielectric medium of supercritical carbon dioxide
요약	Charged colloidal particles are used in various applications, such as pharmaceuticals, electrophoretic displays, paint or slurry formulation and in safety aspects of crude oil processing. In recent years, both fundamental and practical researches have been carried out to elucidate the nucleation and growth of electrostatically stabilized colloidal crystals with aims not only to model atomic systems but to devise methods to prepare composite nanoparticle supperlattices. Since the properties of colloidal dispersions are mainly governed by the electrical charge of particles or droplets, several methods based on electrohydrodynamics have been developed to determine the surface charge or the zeta-potential. It is now a common practice to measure the mobility of particles or droplets in an electric field and use a hydrodynamic model to relate the mobility to the zeta-potential. However, these studies of electrokinetic phenomena have focused on aqueous or polar media. Colloids in low-dielectric medium have received far less attention. In this study, it was demonstrated that zeta-potentials of water droplets dispersed in supercritical carbon dioxide (ε_r=1.5) could be exactly determined from an electrokinetic model of Hűckel's limiting case where the ionic strength, thus the inverse Debye length, is extremely small. Water-in-CO_2 emulsion droplets stabilized with a low molecular weight non-ionic branched hydrocarbon surfactant were observed to migrate to the anode in electric fields (1~20 kV/m) indicating a negative surface charge. For 3-μm water droplets (2.7 vol.%) dispersed in supercritical carbon dioxide at 55°C 386 bar with 2 wt.% of the surfactant, the zeta-potential was measured to be -67 mV which was equivalent to 3~4 elementary charges per square micrometer of droplet surface. The interaction potential determined from zeta-potential measurements were in good agreement with the Boltzmann distribution of inter-droplet spaces as well as the sedimentation profile of the droplet concentration that resulted from the equilibrium between gravity and the electrostatic repulsion. Electrokinetic measurement in nonpolar media is often subject to substantial problems including electroosmosis, non-uniform electric fields due to space charging, Joule heating and electrohydrodynamic instabilities. Experimental techniques to avoid such problems will also be introduced and discussed in the presentation.

연사 류원선 교수(홍익대학교 화학공학과)

2007.09 ~ 현재	홍익대학교	전임강사
2004.12 ~ 2007.08	삼성전자	책임
1999.08 ~ 2005.08	University of Texas at Austin/Chemical Engineering	Ph.D.
1992.03 ~ 1999.02	서울대학교/응용화학부	화학공학 (학사)

(최종학위논문명)
Emulsions and Microemulsions of Water and Carbon Dioxide: Novel Surfactants and Stabilization Mechanisms

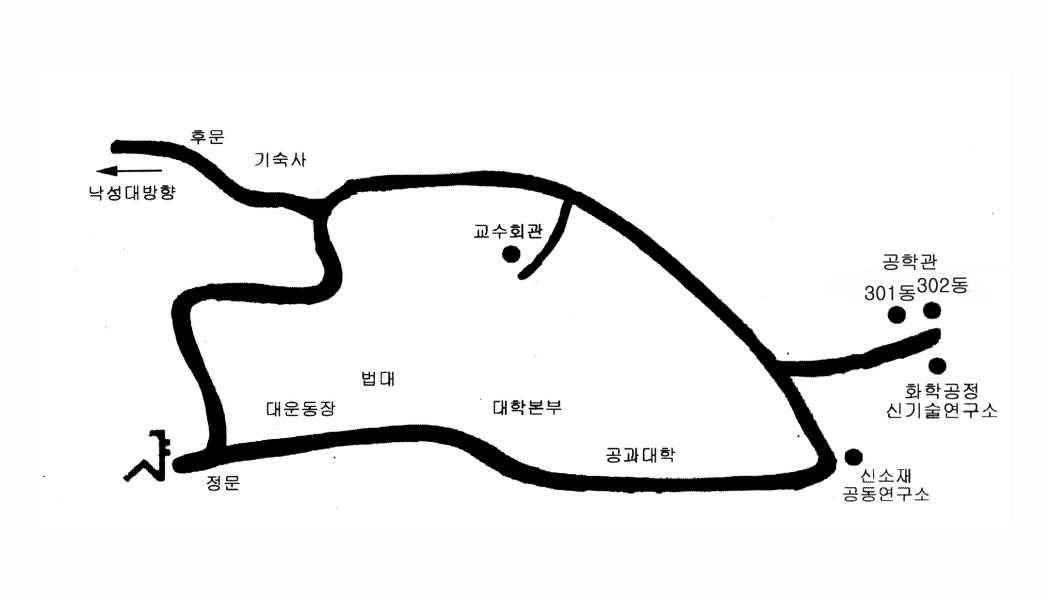
제목	Dependence of Approaching Velocity on the Force-Distance Curve in AFM Analysis
요약	Atomic force microscopy (AFM) has emerged as a useful tool for the microscopic reading the surface morphology, lithographic writing of the nanopattern onto a substrate, and spectroscopic measuring of the conductance between two electrodes. Among these applications, force-distance (F-D) analysis is a fundamental tool in several fields of research, such as surface science, materials engineering, biochemistry and biology. In these fields, F-D curves are routinely used to determine several kinds of measurements, such as elasticity, adhesion energy, Hamaker constants, surface charge densities and degrees of hydrophobicity. In previous report, Evans and others used the biomembrane force probe to test the adhesive strengths of attachments between surface-bound P-selectin, and showed the loading rate is highly dependent upon the rupture force and unbinding force.5 A classical molecular dynamics was also used to investigate the interfacial adhesion between polyester and carbon-based particles. The most interesting regions of F-D curves are the non-contact regions, containing the jump-to-contact and jump-off-contact points, which provide information about the attractive and repulsive forces both before and after contact. In particular, the measured force at the jump-off-contact point relates to the contact adhesive stress, from which the adhesion energy can easily be obtained by integration of the triangular area at this point. When the F-D curves for the mica/NSC36C (L = 130 μm and k = 0.60 N/m) system were measured using a different approaching velocity (Vz = 0.1, 1, and 5 μm/s), they revealed different jump-off-contact forces, resulting in a different adhesion energy in relation to the approaching velocity. As Vz increased, the attraction energy gradually increased, and the F-D curve showed a more negative value. It should be noted that the approaching (or retracting) velocity had a big impact on the attraction force in the F-D curve measurement. This feature distorted the F-D curve between the tip and the substrate, making it difficult to obtain the exact adhesion energy from F-D curve. However, there is less information in the literature on the effect of the approaching/retracting velocity for measuring F-D curves. Therefore, the importance of the approaching/retracting velocity for measuring the F-D curve in AFM analysis was investigated.

연사 김영훈 교수(광운대학교 화학공학과)

2006. 3 ~ 현재	광운대학교 화학공학과	조교수
2005. 3 ~ 2006. 2	서울대학교 BK21 화공사업단	Post doc
2004. 4 ~ 2005. 3	서울대학교 화학공정신기술연구소	연구원
2000. 3 ~ 2005. 2	서울대학교/화학생물공학부	화학공학 (박사)
1994. 3 ~ 2000. 2	고려대학교/화학공학과	화학공학 (학사)

(최종학위논문명)
A Novel Synthetic Method for Tailored Nanoporous Aluminas and Applications to Adsorption and Molecular Level Detection

오시는 길...



후 원