Tokyo University of Agriculture and Technology
Institute of Global Innovation Research

グローバルイノベーション研究院　公開セミナー
Institute of Global Innovation Research Open Seminar

Thursday, December 19 2019

東京農工大学 小金井キャンパス　13号館　講義室L1331
Lecture Room L1331, Building 13, Koganei Campus TUAT

13:00~14:00　　言語 / 英語　Language / English

"Dynamics of microdroplets in multicomponent liquids"

Dr. Xuehua Zhang , Professor
Department of Chemical and Materials Engineering,
University of Alberta, Canada

Phase separation induced by solvent addition is ubiquitous in many technologic and industrial processes, from preparation of pharmaceutical products, to formulation of cosmetics and insecticides, to liquid–liquid microextraction. The new microscopic phase formation induced by solvent addition takes place under the conditions far out-of-equilibrium. The growth dynamics of individual domains is determined not only by the concentration of compositions (thermodynamic aspects), but also by the temporal and spatial characteristics of the mixing process of the solvents (dynamic aspects). We have experimentally and theoretically investigated the effects from the mixing dynamics on the droplet formation under controlled flow conditions. A universal femtoliter droplet-based platform is developed for determination of partition coefficient in water and oil phases and for fast and sensitive nanoextraction of trace of hydrophobic compounds in aqueous solutions. We further revealed the droplet formation from liquid-liquid phase separation in a quasi-2D chamber. Remarkably, the droplets exhibit significantly enhanced the mass transfer in confined spaces. This finding may of relevance to the interfacial process during oil extraction from underground by a

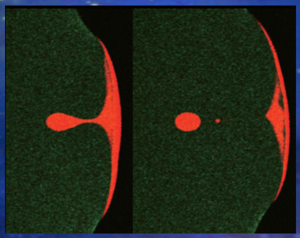

Figure 1. Splitting droplet at four-phase contact line of solid-air-oil-water. The snapshots show an intriguing phenomenon that follows after the four phases oil (red), water (green), solid and gas make contact through the coalescence of two different three-phase contact lines. (Yu et al, Soft Matter 2019)

14:00~15:00

"Ductile fracture probed by tubular specimens under proportional

Dr. Yannis Korkolis, Associate Professor
Department of Integrated Systems Engineering,
The Ohio State University , U.S.A.

Despite many decades of research on ductile fracture challenges remain, especially when considering the peculiarities of tubular geometry and multiaxial, non-proportional stress states during forming. To assess the fracture behavior of AA6260-T4 tubes, experiments under axial force and internal pressure without a die (i.e., free-inflation) were conducted, subjecting the tubes to both proportional and non-proportional loads and taking them to failure. The results are used to model the plastic anisotropy of the material by two non-quadratic anisotropic yield functions - Yld2000-2D and Yld2004-3D. The hardening behavior is identified using uniaxial tension tests on strips cut from the axial direction of the tube. Direct measurement of fracture parameters in these experiments is impossible due to the fracture initiating inside the wall-thickness. Therefore, the ductile fracture behavior is probed using a hybrid experimental-numerical approach. To accomplish this, finite element models of the experiments are generated. Solid elements are used to probe the local stress and strain fields at the onset of fracture at the interior of the tube, and thus establish the fracture locus of the material. These elements are computationally expensive, so they are used to mesh only the region were fracture is expected to occur. The rest of the tube is modeled with shell elements, and a surface-based shell-to-solid coupling is used to join the two regions of the finite element model. The same hybrid experimental-numerical approach is used to probe the path-dependence of the fracture locus.

どなたでも、ご聴講いただけます。
Everyone is welcome to attend.

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Merry Christmas