

2P573**Emulsion based microreactor array in microchamber**

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Small vessels such as liposomes, microchambers, and W/O droplets have been used as microreactors for detection and observation of chemical/biological reactions. Among the methods proposed, the method employing W/O droplets remains very promising, and represents an active area of research. Arraying of W/O droplets will make HTS (High Through-put Screening) possible by allowing massively parallel observation, detection, and analysis of these microreactors. This abstract describes an array of water-in-oil (W/O) droplets that can be used as microreactors. The droplets are created by sweeping water across a microchamber array with an organic phase (hexadecane); water left in the microchambers form droplets after the sweeping and remains trapped in the microchambers. With this method, more than 10,000 droplets are generated at once and placed in each microchamber. Also, we have succeeded in encasing a certain amount of E-coli in each droplets by mixing E-coli with water at the first step of this process. And we also present the concept of extracting a desirable droplet from the chamber array by applying an optical laser beam to the droplet. We hope this system will facilitate various chemical/biological experiments where ultra-large amount of observations with different conditions are required (e.g. protein expressions, crystallization, PCR).

2P575**Nonamer disruption simulation for model PrP^{Sc} using Go model of protein folding**○Hironori K. Nakamura¹, Mitsunori Takano², Kazuo Kuwata¹¹CEID, Gifu Univ., ²Sch. of Sci. & Eng., Waseda Univ.

Transmissible spongiform encephalopathies such as bovine spongiform encephalopathy (BSE), Creutzfeldt-Jakob disease (CJD), and so on, are considered to be caused by the conversion of the normal prion protein (PrP^C) to the pathogenic isoform (PrP^{Sc}). Recently, model PrP^{Sc} structure was proposed by C. Govaerts et al. [1]. Although some mechanisms of PrP^{Sc} propagation have been proposed, they have not been examined much in biophysical point of view because the time scale of propagation is extremely longer than that of the currently available molecular dynamics simulation using the full-atom model.

To investigate biophysical aspect of prion oligomer, we conducted nonamer disruption simulation of the model PrP^{Sc} using Go model of protein folding [2]. The results of disruption simulations show that the disruption process was described roughly in only two steps: from a nonamer to nine monomers, via a hexamer and three monomers. Each step progresses in a cooperative manner, especially disruption of hexamer shows very strong cooperativity. Based on these simulation results, we proposed a new mechanism of PrP^{Sc} propagation similar to the lock-and-dock model.

[1] C. Govaerts et al. (2004) Proc. Natl. Acad. Sci. USA 101, 8342.

[2] C. Clementi et al. (2000) J. Mol. Biol. 298, 937.

2P574**Bio-organic-inorganic ternary nanohybrids for DNA-barcode system**

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We have successfully realized novel DNA-barcode system which consists of encoding, encrypting, decrypting and decoding steps utilizing bio-organic-inorganic ternary nanohybrids. The recent development of biotechnology enables to encode DNA base pair sequence intentionally for secret nano-barcode, however, the instability of DNA strands against external enzymatic surroundings and the difficulties in detecting trace DNA have hampered practical nano-barcode system using DNA strands. Here we propose the nano DNA-barcode system in which the existing problems are solved by developing bio-organic-inorganic nanohybrids. In this system, DNA-LDH (layered double hydroxide) and DNA-polypyrrole-maghemite nanohybrids are developed, and each hybrid material acts as DNA protecting and detecting agent, respectively. In this novel system, encoded DNA strand expresses immutable molecular information by the unique base pair sequence, while LDH matrix offers high dispersion property along with durable stability against enzymatic conditions. On the other hand, DNA-polypyrrole-maghemite hybrid enables one to trace and decipher the implanted DNA codes easily even down to femtomolar level thanks to the intermolecular affinity between polypyrrole and DNA and to the superparamagnetic property of polypyrrole-maghemite hybrid particles.

2P576**Metal ion binding to prion protein**○Yuji O. Kamatari¹, Yoji Yoshimi², Tomoharu Matsumoto¹, Kota Kodama¹, Kazuo Kuwata¹¹Center for Emerging Infectious Diseases, Gifu Univ., ²Marubun Corporation

Prion diseases are fatal neurodegenerative diseases caused by conformational transition of the cellular isoform of prion protein (PrP^C) to the pathogenic scrapie isoform (PrP^{Sc}). Function of the PrP^C is still not clear. But, it is known that the prion protein is a copper binding protein and it is suggested that PrP^C is involved in the copper metabolism. We have applied Dual Polarisation Interferometry (DPI) to study the interaction between the recombinant mouse prion PrP^C and nine different divalent metal ions. Mass, thickness, and refractive index changes induced by the metal ion binding were observed. We have estimated the binding constants, association and dissociation rate constants, and molecular ratios of the protein to metal ions. We found that copper has the highest affinity with PrP^C, but some other metal ions also have a certain degrees of affinity to this protein. This result suggests that PrP^C may participate in the metabolism of not only copper but also some other divalent metal ions.