

List of Dissertation Abstract (Environment and System Sciences    Materials System Course)

Name	Supervisor	Title	Abstract
Mizuki ADACHI	Yoshimi TANAKA	Morphological Transition and Hysteresis of Rubber Ribbon with Loop	Deformation such as tension, compression, and bending of an object is a fundamental problem, but it is especially difficult to tension a twisted object. As a problem like this, in our previous work of this laboratory, we have been studying loops and twists using elastic-plastic body ribbon such as paper, glass ribbon, carbon steel. In this research, we select silicone rubber as an object that does not cause plastic deformation and study the dynamics of loop -twist transition.
Ryo ICHIKAWA	Atsushi SUZUKI	Peeling behavior of polymer films from high adhesive soft interfaces	Peeling behavior with oscillation of peel force was observed in a peeling test using slightly crosslinked PDMS and polymer films. The peeling of films from PDMS with stickiness was measured under different conditions of the film thickness and the peel velocity. This new phenomenon will be discussed on the basis of wrinkles that occur between films and PDMS.
Sho ITO	Atsushi SUZUKI	Contact charging properties of poly(vinyl alcohol) resins with metals	Contact charging has become a problem in a wide range of fields in recent years, for example, there is a defective mounting of packaged electronic components. In this research, we used PVA, which is positive charging property, and PVB which becomes negative charging property by acetalization of PVA, used as a material of package of electronic components. By conducting the contact charging experiment using these samples, the objective is to evaluate and consider how the contact charging potential with the metal changes depending on the ratio of the functional group and the change occurs due to the change Respectively.
Fumihiko KIMURA	Kenji ARAMAKI	Percolation behavior in nonionic surfactant-based w/o microemulsion	We measured the conductivity of nonionic surfactant-based w/o microemulsion consisting of sorbitan monolaurate (Span20) and polyoxyethylene sorbitan monooleate (Tween80) at different temperatures. The conductivity reached the maximum value due to dynamic percolation with temperature increase and then decreased with further temperature increase, which has not been reported in the ionic surfactant-based w/o microemulsion. We clarified the mechanism by structural analysis using small angle X-ray scattering (SAXS).  Converted to a PDF while retaining the format (font style, size, etc) and uploaded to our school's website.

Sachi KOITANI	Kenji ARAMAKI	Formulation of the orthogonal self-assembled systems with cationic surfactants and low molecular organo gelator	Self-assemblies formed by surfactants are given mechanical stability by being associated with fibrillar networks with low molecular gelators. It is expected that these two self-assembled structures develops high functionality by coexisting independently and maintain orthogonality. Therefore, in this study, we tried to prepare systems coexisting with self-assemblies such as lamellar liquid crystal and micelle formed by cationic surfactants and gel-networks, and investigated whether the systems maintain orthogonality.
Ippei KOKUBUN	Junichi TATAMI	Fabrication of nitride phosphor particle dispersed transparent $\alpha$ -SiAlON ceramic composites	In white LEDs, phosphor powder is dispersed in a transparent resin. The resin is easy to be degraded by heating during operation, so lifetime of the white LEDs would decrease. Since SiAlON has good thermal properties, it is a solution to use transparent SiAlON ceramics as a substitute for resin. Therefore, the purpose of this research was to prepare phosphor particle dispersed transparent SiAlON ceramics and evaluate optical properties.
Miharu KOSHINO	Mahito ATOBE	Size-Controlled Synthesis of Polymer Solid and Hollow Particles Using Tandem Acoustic Emulsification	Size-controlled polymer nanoparticles are useful materials in various applications. In this study, we have successfully synthesized polymer nanoparticles which reflect precisely the size of monomer droplets formed by acoustic emulsification without any surfactants. Among the nanoparticles, polymer hollow particles are particularly attractive materials due to their unique structure. Therefore, we also tried to prepare size-controlled polymer hollow particles. In this process, the acoustic emulsification is used to produce fluoruous solvent droplets which are templates for polymer capsule synthesis. TEM analysis revealed that polymer hollow particles were obtained. Since any surfactants are unnecessary, the acoustic emulsification is indeed a powerful tool for the synthesis of size-controlled polymer nanoparticles.
Fuminori SATO	Atsushi SUZUKI	Mechanical Strength and Anisotropic Swelling Behavior of Laminated poly(vinyl alcohol) Hydrogels	In this study, CD plates with two-layer structure were prepared by different drying temperatures under the constant humidity, 80%RH. The weight of PVA solution used for the respective layer was 15g (total 30 g). The “60°C15g+8°C15g” indicates that the first and second layer was prepared by drying at 60°C and 8°C, respectively. The tensile strength and the linear swelling ratio were measured. Due to the difference of drying temperature between upper and lower layers, the laminated CD gel showed anisotropic swelling behavior, and the higher mechanical strength.

Mariko SADO	Junichi TATAMI	Improvement in thermal conductivity of Si <sub>3</sub> N <sub>4</sub> ceramics through a low magnetic field orientation technique using composite particles with anisotropic gigantic diamagnetism	Si <sub>3</sub> N <sub>4</sub> ceramics were fabricated by molding in a low magnetic field using graphene-coated Si <sub>3</sub> N <sub>4</sub> particles as seeds for β-Si <sub>3</sub> N <sub>4</sub> grain growth. Si <sub>3</sub> N <sub>4</sub> ceramics fabricated using the composite particles having higher crystallinity showed better c-axis orientation by molding in a low and static magnetic field, resulting in higher thermal conductivity.
Masahiro HAYAKAWA	Motoyuki IIJIMA	The design of spherical porous silica composite particles prepared by mechanical treatment and the water drying properties at particle film surface	The design of composite particles in which silica nanoparticles are coated on silica spherical porous particles by mechanical treatment was investigated. The influence on the wetting and spreading behavior of water droplets and the drying behavior on the particle film in which the amount of nanoparticles added to the porous particles was varied was evaluated.
Atsushi FUKAZAWA	Mahito ATOBE	Electrochemical Hydrogenation of Various C-C Double Bonds Using a PEM Reactor	We have investigated the electrochemical hydrogenation of toluene using a proton exchange membrane (PEM) reactor for development of organic chemical hydride system. Especially, an influence of catalyst materials for a PEM reactor on the by-product formation and product selectivity in the hydrogenation of toluene was investigated. On the other hand, we have also carried out electrochemical asymmetric hydrogenation of monomethyl itaconate in order to expand the versatility of PEM reactor. In this project, we demonstrated that the used of chiral polyamide as a chiral source gave relatively high optical yields of the product. This can be regarded as economic and environment-friendly system because of its operation with mild reaction conditions and reusability of expensive noble metal catalysts.
Kota FUSHIMI	Mahito ATOBE	Regioselective electrochemical synthesis of oligophenylenes using electron auxiliary groups	In this work, electrochemical synthesis of oligophenylene, and its regioselective and molecular weight control were demonstrated using 1,4-bis(trimethylsilyl)benzene monomer and flow microreactors. This synthetic system enabled regioselective synthesis of oligophenylene without its deposition. Careful selection of the reaction conditions enabled the control of molecular weight and distribution of the synthesized oligophenylene. In addition, this method has the major advantage of not requiring sensitive, expensive, or toxic reagents. Moreover, the reaction could be conducted using single flow-through operations under very mild conditions.

Misaki FUJII	Kenji ARAMAKI	Formation of silicine surfactant-based wormlike micelle being stable at low temperature	A typical string-like micelle forming system that has been reported in the past is that many hydrophobic parts of surfactants are synthesized with alkyl chains, and it is a problem that it is easy for individuals to precipitate at low temperature due to high intermolecular attraction there were. In this study, we succeeded in forming low-temperature stable string-like micelles by using a new silicone surfactant to maintain the solution properties of string-like micelles even at low temperature.
Ayuka MATSUGAMI	Junichi TATAMI	Tribology related to machining of AlN ceramics and molding of SiO <sub>2</sub> glass powder	Machining and molding in the manufacturing process of ceramics can be regarded as tribology. In order to produce better ceramics, it is important to understand their tribology. In this study, we aimed to elucidate tribology of machining and molding of ceramics. We evaluated the wear behavior of AlN ceramics in both water and air conditions as the model of machining and the friction behavior of SiO <sub>2</sub> glass whose surface condition was changed as the model of molding process.
Shunsuke MIZUMOTO	Motoyuki IJIMA	Elucidation of sulfuric acid resistance mechanism of hardened cement body by acrylic latex copolymerized with acrylic silane	Effect of acrylic silane copolymerized acrylic latex addition on their resistance properties against sulfuric acid has investigated. The collapse of hardened cement body after corrosion test in sulfuric acid solution has suppressed by the addition of acrylic latex and this effect was remarkable when acrylic latex copolymerized with acrylic silane was added. It was also found that the acrylic latex exists between the cement particles and effectively bonded the cement particles with acrylic silane.
NAU MORITA	Kenji ARAMAKI	Formation of wormlike micelles by amino acid-based gemini surfactant	We investigated interfacial properties and wormlike micelles of amino acid-based gemini surfactant, bis(N $\epsilon$ -lauroyl-L-lysine) sebacamide (12L-8-L12). We measured static surface tensions of solutions at high and found that cmc was 0.0035mM. We prepared wormlike micelles by 12L-8-L12/CTAB/water system. We found that spacer length contributed to cmc and viscosity, indicating that the short spacer chain acts as if separating hydrophilic groups and the long spacer chain acts as a hydrophobic moiety. The wormlike micelles depended on temperature and pH, and gelled at low pH.