

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

Name	Supervisor	Title	Abstract
Hiroki ISHIKAWA	Atsushi SUZUKI	Improvement of friction and wear characteristics of physically cross-linked poly (vinyl alcohol) gel by a laminating method	Polyvinyl alcohol (PVA) gel has an excellent water retainable and high biocompatibility. Many studies on applications, such as artificial cartilage conducted. But we still haven't had a practical sample. Physically cross-linking PVA gels has mainly two types. One is freeze and thawing gel (FT gel). The other is cast-drying gel (CD gel). We aimed at improvement friction and wear property by laminating these two physical cross-linking PVA gels (We call this laminated gel "Hybrid gel").
Daisuke KAWAI	Jyunichi TATAMI	Influence of the added rare earth oxide on volume resistivity of Si ₃ N ₄ ceramics	Volume resistivity of the Si ₃ N ₄ ceramics prepared by adding rare earth oxide was investigated. Although many kinds of the Si ₃ N ₄ ceramics prepared by adding rare earth oxide showed superior electrical insulation at room temperature, the Si ₃ N ₄ ceramics prepared by adding Yb ₂ O ₃ showed low volume resistivity. The volume resistivity of the Si ₃ N ₄ ceramics prepared by adding Yb ₂ O ₃ decreased with an increase in the temperature and the applied electric field. The volume resistivity of Yb-contained oxynitride glass and Yb ₄ Si ₂ O ₇ N ₂ (J-phase) also decreased in the temperature and the applied electric field. In comparison with dependence of the volume resistivity on the applied electric field, it was shown that J-phase dominated the volume resistivity of the Si ₃ N ₄ ceramics. The electrical properties were explained by hopping conduction mechanism due to the coexistence of Yb ²⁺ Yb ³⁺ in J-phase.
Takahiro KIMURA	Mahito ATOBE	Preparation of Mutual Multi-layer Structure Composites of Metal and Conducting Polymer Using Electrochemical Deposition	We have developed a novel electrical deposition method for preparation of mutual multi-layer structure composites of metal and conducting polymer. This new synthetic method involves alternating anodic and cathodic polarizations of a working electrode for mutual deposition of conducting polymer and metal films, respectively, in a same electrochemical cell. In this work, we have successfully prepared the mutual multi-layer structure composites of polypyrrole and nickel by using this method.

<p>Minami KIMURA</p>	<p>Kenji ARAMAKI</p>	<p>α-Crystalline Phase Behavior in Aqueous System with Sucrose Monostearate and Monoglyceride</p>	<p>An α-type hydrated crystalline phase with sucrose monostearate (C18SE) ,monostearin (MS) and monoorein(MO) was dispersed in an excess amount of water as nanoparticles stabilized with various deispersants. The most stable lipid nanoparticles can be formulated with sodium caseinate (CN) and they were kept stable for more than 1 week. DLS measurements showed particle size was around 100 - 200nm and SAXS measurements showed water content of C18SE dominant and MS+MO-dominant mixing phase α-type hydrated crystal was 78~83%.</p>
<p>Tomoya KUNO</p>	<p>Mahito Atobe</p>	<p>Preparation and Characterization of Colloidal Crystals Composed of Core-Shell Polymer Nanoparticles</p>	<p>We successfully prepared electroresponsive structurally colored materials composed of ordered arrays of polyaniline@poly(methyl methacrylate) (PANI@PMMA) core-shell nanoparticles. The core-shell nanoparticles were synthesized by deposition of PANI shell on the surfaces of the PMMA cores and then their ordered arrays were fabricated. These core-shell colloidal crystals exhibited colorations resulting from the combined effects of these materials. The crystal colors depended greatly on the size of PANI@PMMA particles and could also be varied by the application of an electrical voltage. On the other hand, we also successfully prepared novel elastic silicone sheets with reversible tuning structural color using PANI@PMMA core-shell nanoparticles.</p>

Ken TAKANO	Mahito ATOBE	Electrochemical hydrogenation of toluene and their analogues using a PEM reactor	<p>Chemical conversion of toluene to methylcyclohexane has been examined to develop an organic hydride system. Under this background, we have investigated the electrochemical hydrogenation of toluene using a proton exchange membrane (PEM) reactor. In this work, a PEM reactor, which has been applied to a polymer electrolyte fuel cell and industrial electrolysis technology, has been developed to improve the electrochemical hydrogenation of toluene. In addition, the reaction mechanism was estimated from the product distribution in the electrochemical hydrogenation not only of toluene but also of o-xylene.</p>
Takehiro TANAKA	Junichi TATAMI	Translucency and fluorescence give to β -SiAlON ceramics	<p>It has been reported that Eu doped β-SiAlON is a green emitting fluorescent substance for white light emitting diodes. In this application, the Eu doped β-SiAlON particles are used to be dispersed in resin. In the resin/β-SiAlON composite LED, deterioration of the resin occurred because of high temperature and ultraviolet radiation. Translucent fluorescent β-SiAlON ceramics is one of the solutions to solve this problem. In this study, translucent fluorescent β-SiAlON bulk ceramics were fabricated by adding HfO_2, Y_2O_3 and SiO_2 as a sintering aid. It was confirmed that the developed Eu-doped β-SiAlON ceramics showed translucency and green emission.</p>

<p>Yoshitomo TSUKIJIMA</p>	<p>Kenji ARAMAKI</p>	<p>Niosome and bicelle formulation of double-tailed polyglycerol surfactants of double-tailed polyglycerol surfactants</p>	<p>Nonionic vesicles, which are called niosomes or NSVs, have been the focus of attention as an alternative to phospholipid liposomes as drug carriers. In this study, novel double-tailed nonionic amphiphiles, polyglyceryl dialkyl ethers can form bilayer structure. In a dilute region, small niosomes of about 80 nm and bicelle of about 20nm were formulated by ultrasonication, cholesterol addition in this surfactant lamellar phase induced the phase transition to the liquid ordered phase. The niosome with cholesterol was stable at least 100 days and stable against SDS.</p>
<p>Yosuke MUKAI</p>	<p>Junichi TATAMI</p>	<p>Influence of sintering additives on thermal expansion of Si₃N₄ ceramics</p>	<p>It is important to know thermal expansion of Si₃N₄ ceramics. Especially, sintering additives influence thermal expansion of Si₃N₄ ceramics. As a result, it is low thermal expansion to use the sintering additives in small atomic weight, short bond distance and strong bond strength without the secondary phase or changing grain boundary glass phase. Using TiO₂ as sintering additives, high thermal expansion was showed because of TiN in the secondary phase.</p>

<p>Yasuaki MORIGAKI</p>	<p>Yoshimi TANAKA</p>	<p>Dynamics of formation of the loop-twist transition and the kink in elastic-plastic body ribbon</p>	<p>We change the form of an object by adding power in daily life. The method is various, for example push, pull, bend, and twist. We were interested in the shape of the object which we added a twist to. It is difficult to describe the shape when added a twist to an object exactly. In this study, we study a change of the shape due to twist and a kink phenomenon that is one of the problems to happen by adding twists using the elastic-plastic body ribbon.</p>
<p>Satoshi YANO</p>	<p>Yoshimi TANAKA</p>	<p>Solvent effect on fracture of hydrogels -Correlation of diffuse dynamics and fracture behavior of gels-</p>	<p>Gels have three-dimensional network structure of polymer cross-linked by chemical or mechanical bonds, and contain large amount of solvent. Gels are very soft and exhibit non-linear mechanical responses even for small stresses. Also, their network structure is very sensitive to solvent condition such as temperature, pH and ion strength. We have studied coupling effects between non-linear mechanical responses and the solvent condition. We peeled gels under existence of solvents around crack tips and analyzed correlation of peeling speed and fracture energy. And we found analogy between fracture behavior and diffuse dynamics.</p>

<p>Yuki Watanabe</p>	<p>Kenji Aramaki</p>	<p>Preparation of bicelles using the semi-spontaneous method</p>	<p>Bicelles are smaller than liposomes and are expected to show greater efficiency in transdermal drug delivery. Formulating bicelles with low-cost materials and avoiding complicated formulation processes would extend the application fields of bicelles. In this study, lecithin and Tween80 were dissolved in 1,3-butanediol, and the mixture was then dispersed in water by ultrasonication. Using this semi-spontaneous method, we obtained bicelles that were stable up to 180 days. We also obtained bicelles with cholesterol using this method. These findings regarding bicelle formulation with low-cost materials using the semi-spontaneous method are useful for the future development of pharmaceutical and cosmetic products.</p>
<p>PHAN VU THUY NHUNG</p>	<p>KENJI ARAMAKI</p>	<p>The effect of solubilization of hydrophobic substances on viscosity coefficient of wormlike micellar solution</p>	<p>Wormlike micelle has high viscoelastic. So, wormlike micelle is used in many products such as lubricant, dishwashing liquid. In this study, we research about the effect of pluronic (P123, F127, 25R2, 25R4), oil (decane, squalane, cyclohexane), perfume (limonene, <i>p</i>-cymene) as hydrophobic substances on the viscosity coefficient of wormlike micelle solutions. P123, F127, 25R2, 25R4, decane and squalane decreased the viscosity of wormlike micelle solutions. Cyclohexane, limonene, <i>p</i>-cymene increased the viscosity of wormlike micelle solutions, then decreased the viscosity of wormlike micelle solutions.</p>