

List of Dissertation Abstract (Department of Artificial Environment)

Name	Supervisor	Title	Abstract
Yuta Shiga	Shibutani Tadahiro	Study on design of pressure vessels with composite structure	This paper developed a “design by rule” for Type III composite cylinders under the assumption of thin-walled cylinders and evaluated its effectiveness using experimental results and past case studies. Furthermore, since the compressive residual stress in the liner generated by the autofrettage significantly affects fatigue life prediction, we systematically organized the best fit fatigue curves and the mean stress correction methods from existing standards alongside the fatigue test results for aluminum alloy 6061-T6, thereby proposing a method for predicting fatigue life.
Tsuchida Yusuke	Matsumiya Masahiko	Modeling of Au(III) Solvent Extraction Based on Interaction and Hydrophobicity Descriptors	The factors governing the apparent equilibrium constant for solvent extraction of precious metals are still not fully understood, and general and predictive descriptors of solvent extraction are currently unavailable. This study focused on the ion-pair extraction of Au(III) and examined the validity of interaction-based approaches commonly used in solvent-extraction modeling. The results showed that for Au(III) systems, intermolecular interactions alone cannot explain the extraction behavior. Rather, descriptors representing hydrophobicity play the dominant role, while electron affinity makes an auxiliary contribution. These findings elucidate the factors governing Au(III) extraction and provide a basis for future computational design of more effective extractants.

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Wang Shangke	Yasumoto Masanori	Exploring How to Gain Competitive Advantage under Shared Platform: The Analysis of the Knowledge Networks on the Mobile Telecommunication Sector	Firms disseminate technology through the standardization of shared platforms, gaining competitive advantages while also facing the risk of technological spillovers. This study analyzes knowledge networks in the mobile communication industry to reveal how firms manage technology through Standard Essential Patents (SEPs). It demonstrates that firms can achieve technological governance and gain competitive advantage by strategically selecting, acquiring, and exploiting technologies within the standardization process.
Asano Hotaka	Aramaki Kenji	Development of a New Evaluation Method for Foam Persistence in Dishwashing and Optimization of Detergent Formulations	Simulating sponge handwashing conditions, the foam disappearance concentration range was quantified (approximately 0.7 wt%). Considering oil stains on dishes, we established a new evaluation method that simultaneously predicts foam retention and cleaning power using a dual-axis assessment of $(d\gamma/dt)^*$ and oil affinity $\Delta R = (d\gamma/dt) - (d\gamma/dt)^*$. It was clarified that adding nonionic surfactants to AES/DDAO backbone micelles promotes monomer release and improves foaming properties due to increased Laplace pressure from smaller micelle size. Specifically, C ₁₂ MEA(2) acts as an effective booster, providing molecular design guidelines for formulation optimization.

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Inoue Akinori	Kameya Takashi	Analysis of Cleaning Performance Affected by Denaturation and Degradation of Blood Protein	This study evaluated the impact of denaturation and degradation of blood-derived protein soils on cleaning performance, focusing on changes caused by hydrogen peroxide-induced denaturation and enzymatic degradation. Using the probability density function method, distribution parameters for adhesion strength and cleaning power were calculated and analyzed. The results indicated that denatured stains can be regarded as a composite of native and denatured protein residues. Furthermore, enzymatic treatment proved effective for cleaning denatured blood protein soils, revealing that soils of varying strength exist depending on the degree of degradation—like the behavior of denatured soils.
Tachikawa Masashi	Aramaki Kenji	Research on Persistence of the Antibacterial and Antiviral Effects after Handwashing Utilizing Coacervation Technology	In infection control, it is essential to address not only the immediate antibacterial and antiviral effects of handwashing but also the reduction of pathogen re-adhesion to the skin after washing. This study focused on formulations designed to leave active ingredients on the skin surface, thereby providing persistent antibacterial and antiviral effects. Novel evaluation methods were developed, effective components were identified, and their mechanisms of action were analyzed. These findings provide a scientific foundation for the development of innovative skin cleansers with persistence of the antibacterial and antiviral effects, contributing to improved strategies for preventing contact transmission.

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Yu Jian	Matsumoto Shinya	Formation Mechanism of J-Aggregates in Molecularly Oriented Vacuum- Deposited Bisazo Dye Thin Films	This study elucidates the formation mechanism of J-aggregates in vacuum-deposited bisazo dye thin films. Analyses reveal that J-aggregates distribute non-uniformly, localizing at crystal domain branching points and grain boundaries. Crucially, we demonstrate a competitive relationship between stable crystal growth and metastable J-aggregate formation. Based on these findings, this research proposes a novel design guideline: moderately suppressing crystal growth to introduce structural fluctuations is the key to facilitating J-aggregate formation in solid-state systems.