

# Laboratory of Nanobiomaterials OKAMURA LAB

## 岡村研究室



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## Development of Innovative Nanobiomaterials and Their Medical Applications

Keywords: Macromolecular chemistry, Molecular assembly, Nanobiomaterials, Drug delivery, Ultra-thin film (Nanosheets), Nanoparticles

### Background and Motivation

Much attention has recently been focused on the field of nanotechnology. Nano-sized structures with a large specific surface area ( $\text{m}^2/\text{g}$ ) in devices lead to high reaction efficiencies on the interfaces. As a result, size, weight and cost of the devices reduce. For example, ultra-thin films (nanosheets) has been developed as nanoseparation membranes and flexible nanosensors for electrochemical and photochemical applications. However, it may be hard to apply them for biomedical treatment, because monomer itself and preparative methods were very complicate.

In our laboratory, we develop innovative and unique “Nanobiomaterials” for medical treatment and other advanced technologies by simple methodologies based on macromolecular chemistry and molecular assembly. Especially, we investigate the relationship between characterization of the nanobiomaterials (shape, size, thickness, interface and viscoelasticity etc.) and their potential abilities as follows:

1. Development of Innovative and Unique Nanobiomaterials for Biomedical Applications
2. Development of Intelligent Nanobiomaterials Based on the Function of Cell Shape Changes (filopodia, lamellipodia and spreading)

### Originality

1. Our key technique is to detach the nanobiomaterials from substrate to use them as a suspension for biomedical applications (drug delivery and diagnosis).
2. We design the nanobiomaterials based on theory of viscoelasticity. Therefore, we could investigate the detailed relationship between their characterization and function.
3. We design the intelligent nanobiomaterials with abilities of cell-like shape changes such as filopodial extension and spreading. The concept could be creative and challenging researches.

### Impact and Perspective

We will develop innovative and unique nanobiomaterials with the concept of Engineering-Based Medicine. The nanobiomaterials (e.g. nanosheets and nanoparticles etc.) could be applied as not only nonconventional injectable carriers for drug delivery and diagnosis but also external use to skins, scaffolds for tissue engineering, surface modifiers and cosmetic materials. Interestingly, the nanosheets have a large specific surface area ( $> 1000 \text{ m}^2/\text{g}$ ). Therefore, they may be also applied as impurity removers from water, antireflective materials and surface modifiers etc. in energy and environmental sciences.

#### For more information:

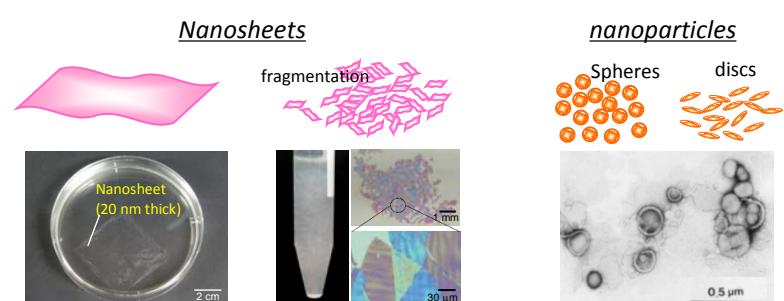
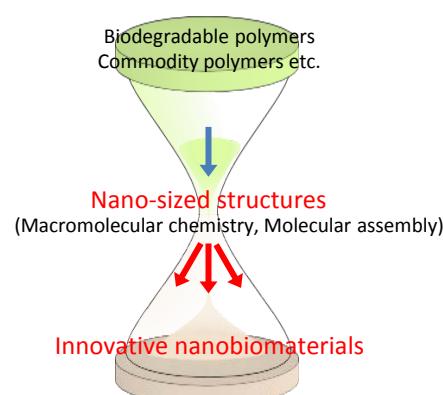
[www.u-tokai.ac.jp/tuiist/english/tt/announcement\\_okamura.html](http://www.u-tokai.ac.jp/tuiist/english/tt/announcement_okamura.html)

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【Aims】 We develop innovative and unique “Nanobiomaterials” for medical treatment and other advanced technologies by simple methodologies based on macromolecular chemistry and molecular assembly.

#### 【Research style】



Carriers for drug delivery and diagnosis, external use to skins, scaffolds for tissue engineering, surface modifiers and cosmetics etc.