Medical application of superaccurate laser processing

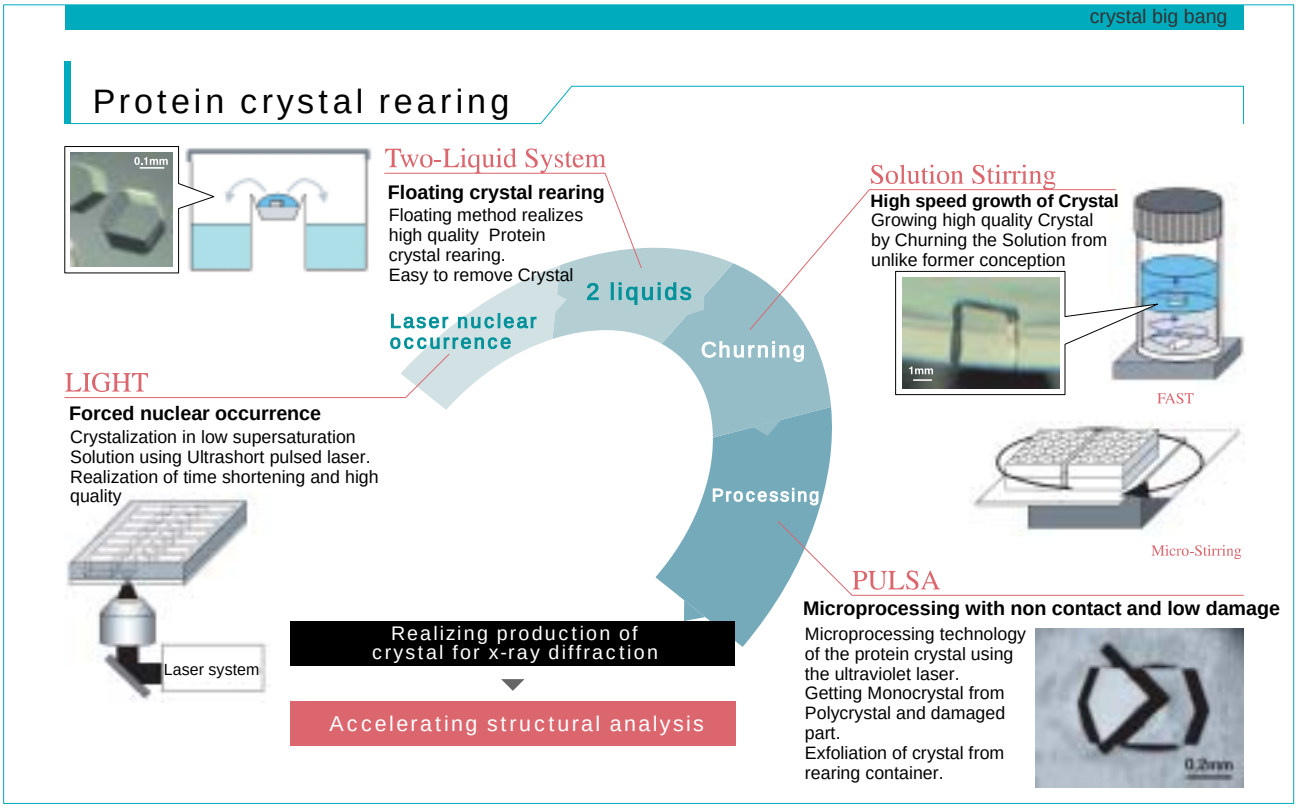
Protein crystallization, Laser processing, Artificial joint, Complete solid-state ultraviolet laser, Protein structure analysis

Representative researcher : Yusuke Mori (associate professor)
Electrophysical engineering, Electric Material/Physical Engineering, Electrical Engineering, Department of Engineering Research

1 Protein crystallization and structural analysis

Elucidation of stereostructure is important for the functional analysis of protein. Generally, protein is crystallized, and the stereostructure is clarified by X-ray structure analysis. However, high-quality crystallization is difficult for many proteins, and crystallization of membrane proteins, which are important for medicine and new drug development, is a subject of interest.

For proteins difficult to crystallize, Osaka University has originally developed 1) crystal nucleus generation process by femtosecond laser irradiation, 2) high-quality crystallization process by stirring of solution, and 3) protein crystal processing by complete solid-state 193 nm laser, and markedly improved the success rate of structural analysis by application of these techniques, compared to that using the standard method. In this COE, we aim at highly precise structural analysis of various proteins.



Medical application of superaccurate laser processing

Protein crystallization, Laser processing, Artificial joint, Complete solid-state ultraviolet laser, Protein structure analysis

Representative researcher : Yusuke Mori (associate professor)
Electrophysical engineering, Electric Material/Physical Engineering, Electrical Engineering, Department of Engineering Research

2 Development of an artificial joint (collaborative study with Dr. Yoshikawa)

We have succeeded in promoting the entrance of osteocytes into grooves prepared by laser processing on the artificial joint surface and improving the strength of contact with bone in collaborative studies with Orthopedics, Department of Medical Research, for the first time. In this COE, we will develop superaccurate laser processing and materials for maintenance of strength of the main body of artificial joints.

Medical application of superaccurate laser processing

Protein crystallization, Laser processing, Artificial joint, Complete solid-state ultraviolet laser, Protein structure analysis

Representative researcher : Yusuke Mori (associate professor)
Electrophysical engineering, Electric Material/Physical Engineering, Electrical Engineering, Department of Engineering Research

3

Tissue processing using complete solid-state ultraviolet laser

We will establish the superaccurate laser processing step for tissues and cells using a complete solid-state 193 nm laser of wavelength-converting crystal CsLiB6010 discovered at Osaka University. This laser generates highly repetitive laser pulses with a short-pulse width, which excimer lasers cannot generate, allowing non-heating processing, compared to the current ArF excimer laser. Using this property, we aim at applying it to tissue processing steps such as refractive surgery.

Other study contents of Mori laboratory

- Development of GaN bulk crystals for photon device
- Development of novel nonlinear optical crystals
- Development of novel organic nonlinear optical crystals for generation of terahertz waves
- Protein crystallization project