

SHIRAKASHI LAB.



Various Aspects of Biological Water Dynamics
- Dielectric/Short Wave Infrared Spectroscopy and Molecular Dynamics -

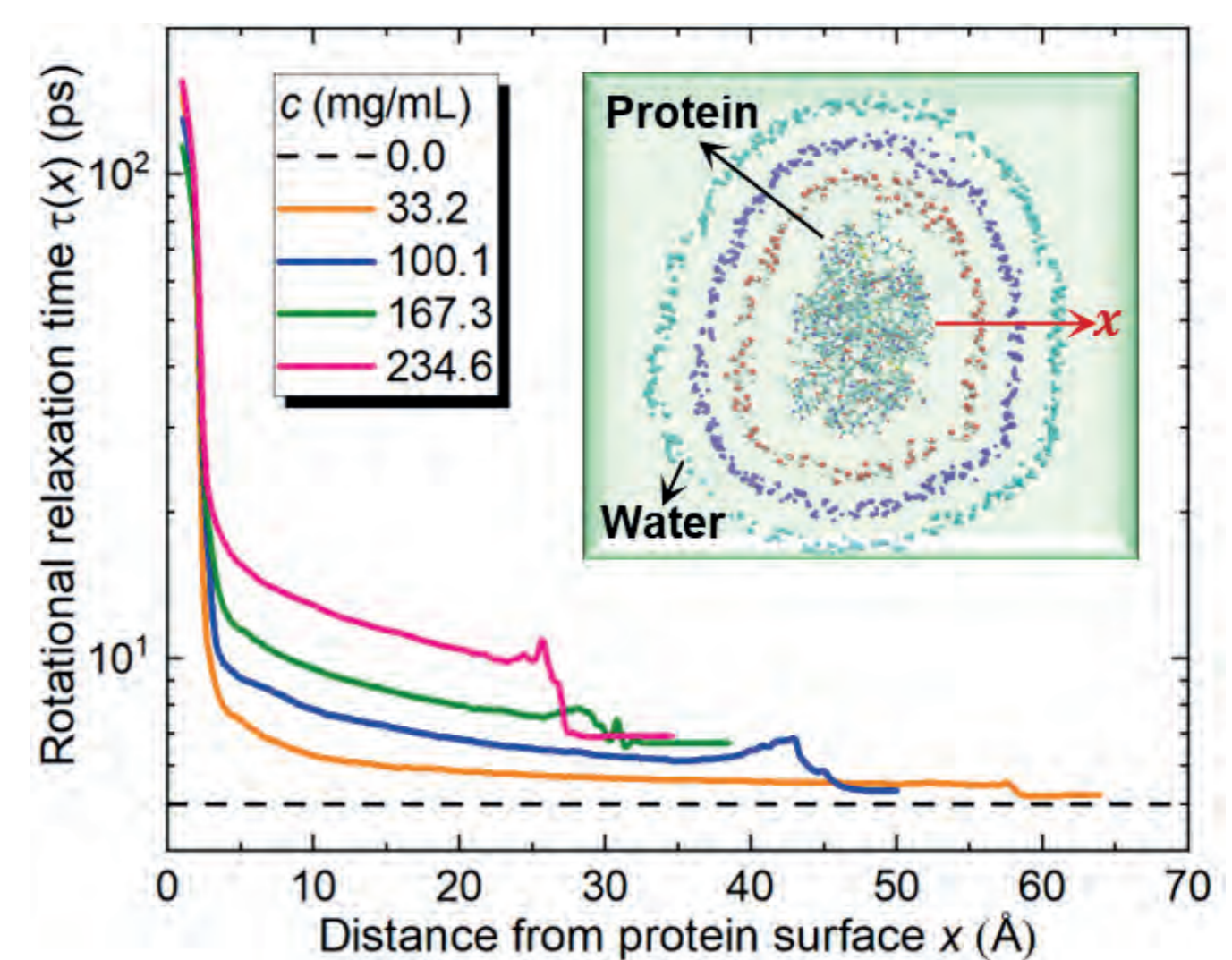
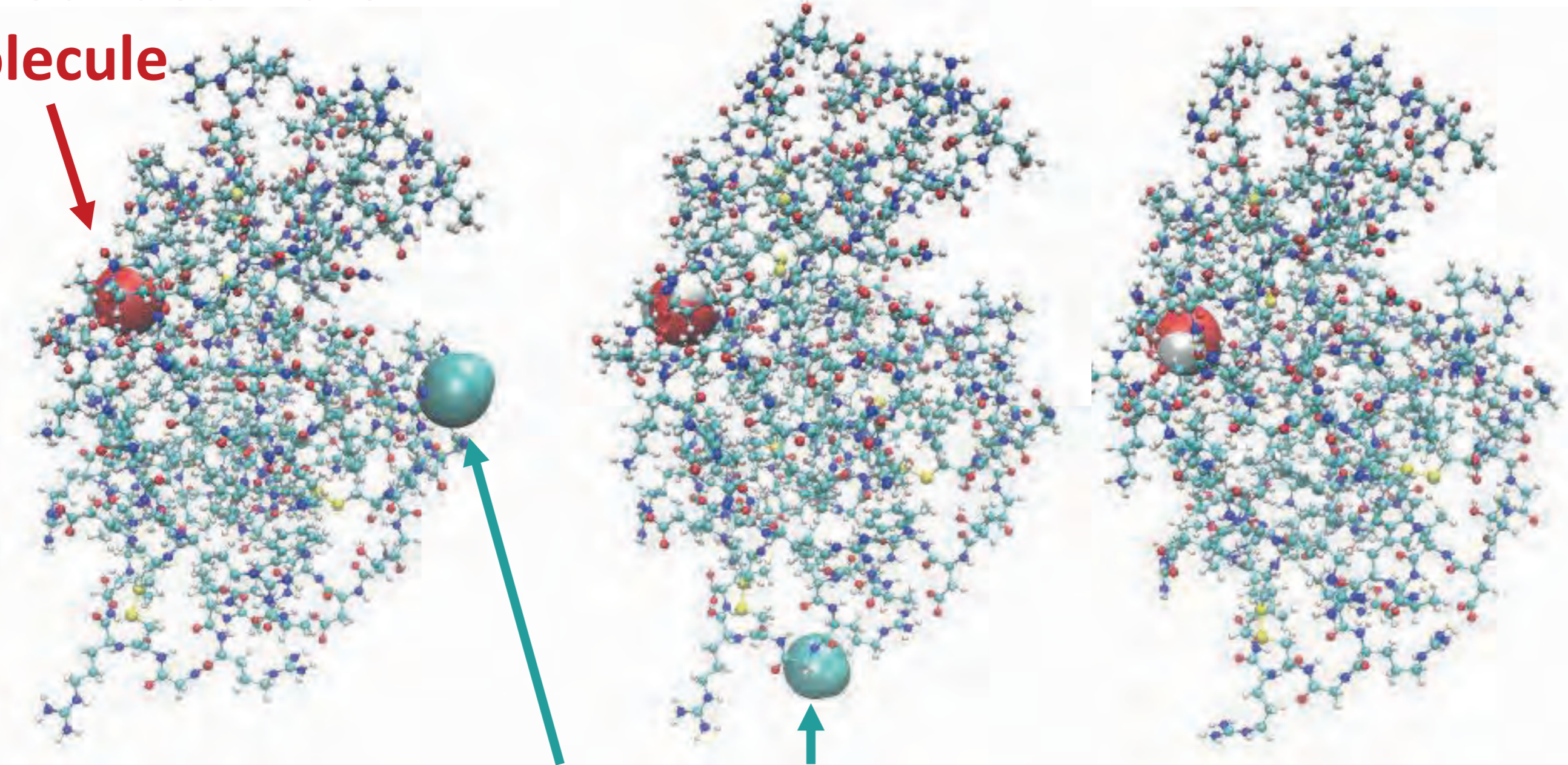
Department of Mechanical and Biofunctional Systems

Phase Change Thermal Engineering
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Water is vital for biological matters. In biological system water molecules show different dynamics and energy states from bulk water because of close interaction with a variety of biomolecules. We are measuring these unique states of water by Dielectric/ Infrared Spectroscopy and calculating them with Molecular Dynamics Simulation to reveal how these water states define the macroscopic properties of biological matters.

1. Bounded water molecule

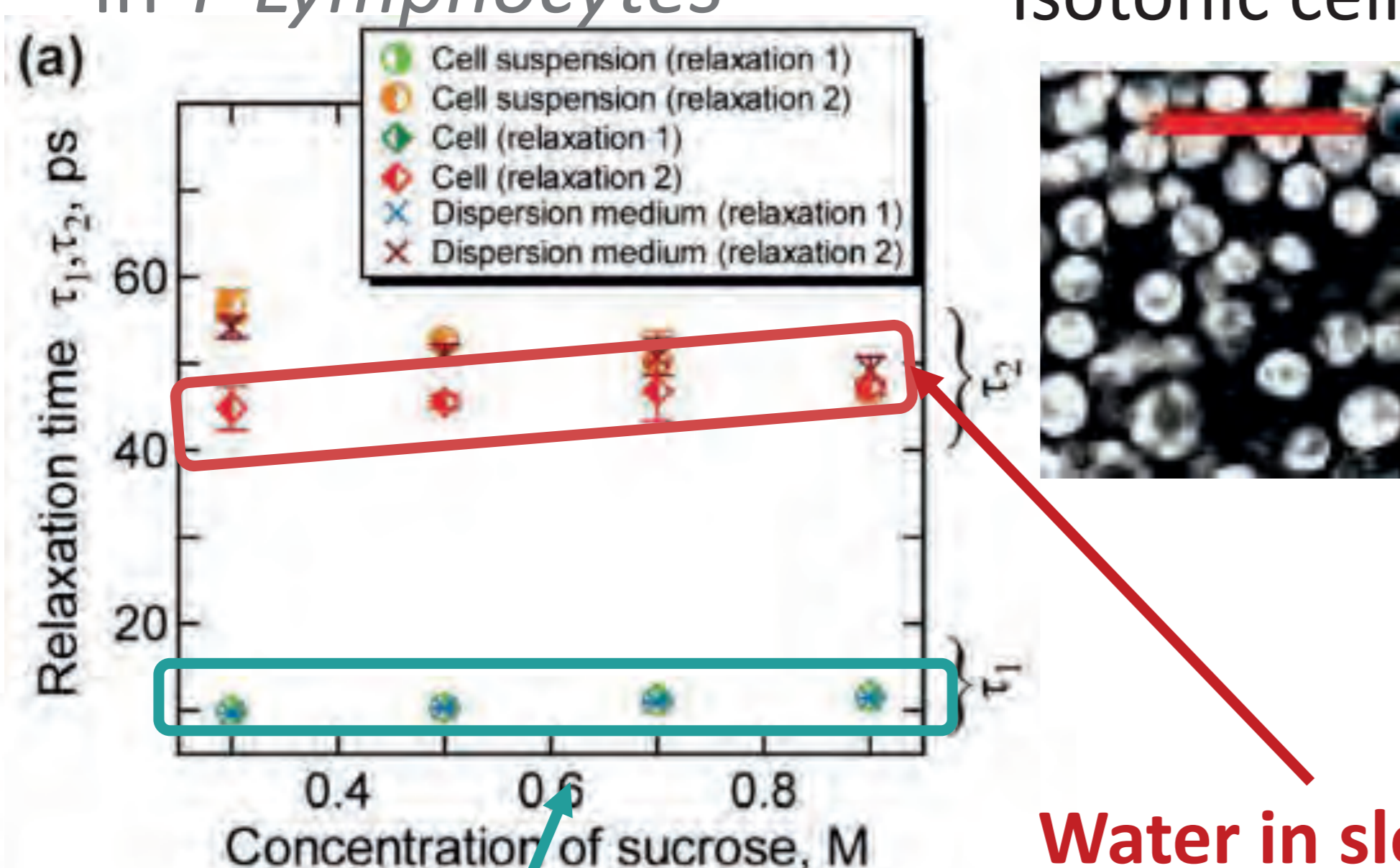
© Water molecular dynamics around protein molecule



Hu et al., JPCB,126, 2022

2. Water bounded to dissociated

© Water molecular rotational relaxation time in *T-Lymphocytes*



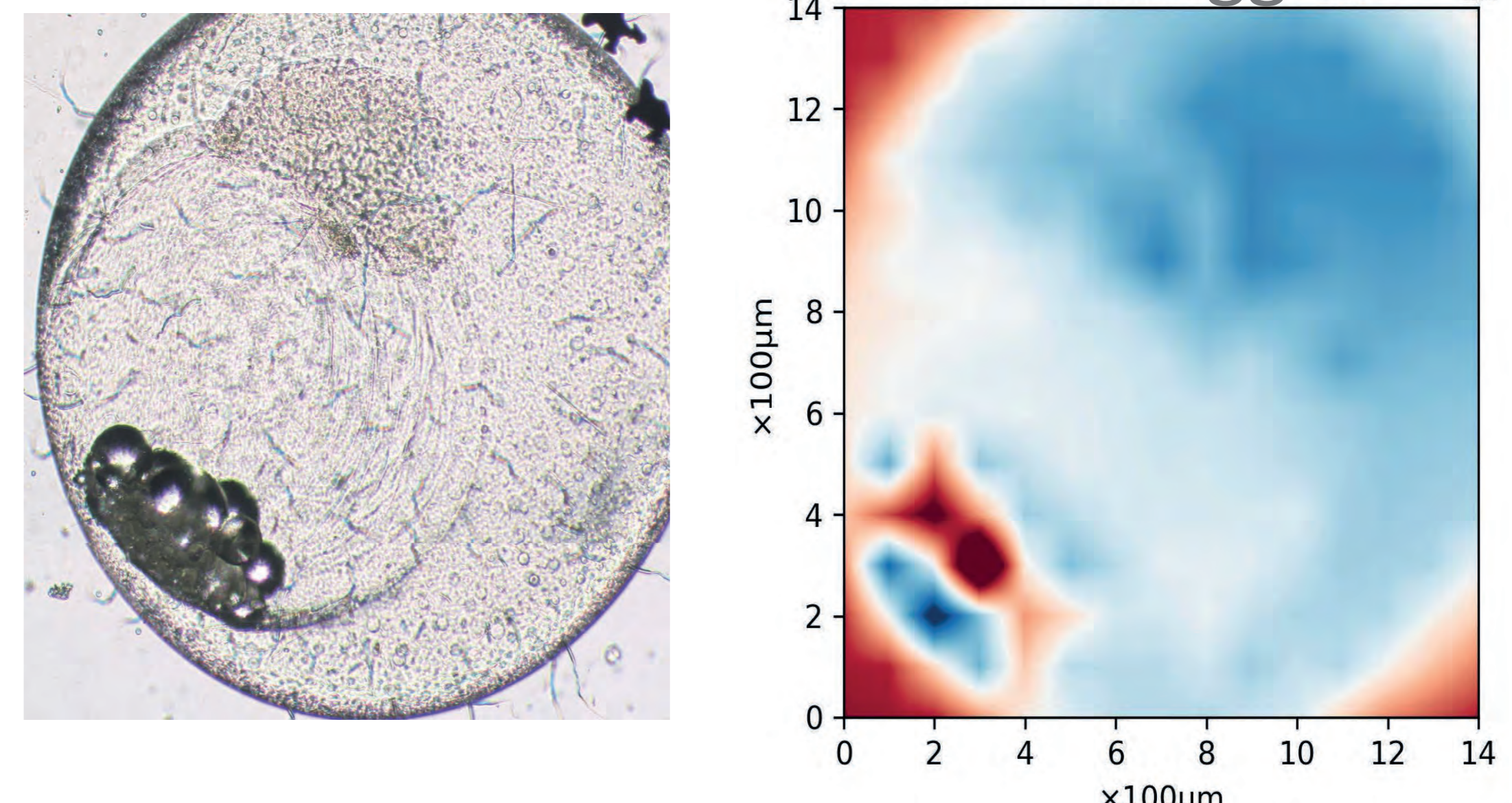
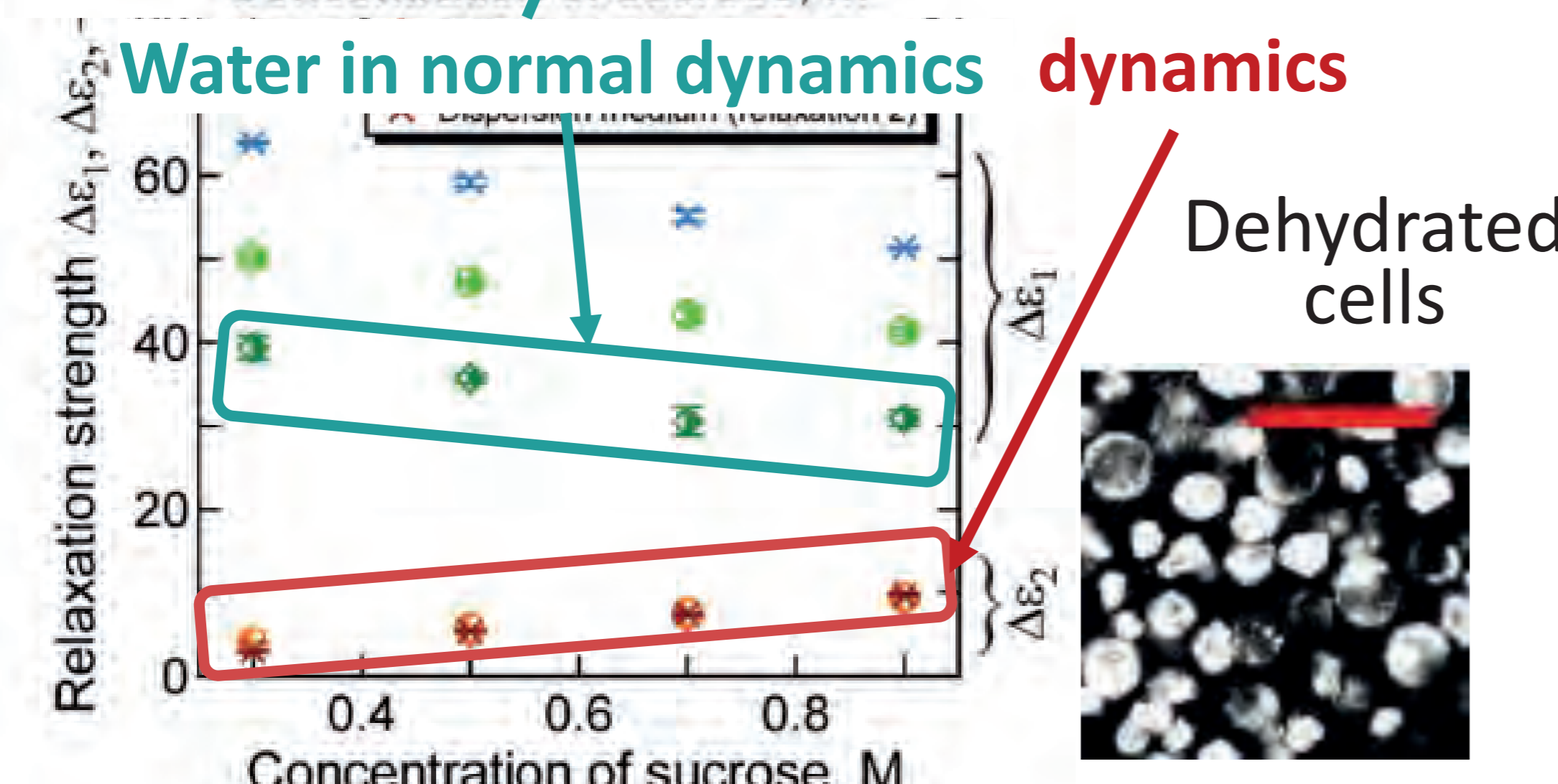
Dielectric Spectroscopy

MD Simulation

Water rotational relaxation time
Hydrogen bonding energy

Infra-red Spectroscopy

© Distribution of water molecular rotational relaxation time in *Medaka* fish egg



Matsuura, et.al., RSC Adv., 2023, 13, 20934