

SHIRAKASHI LAB.



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

Department of Mechanical and Biofunctional Systems

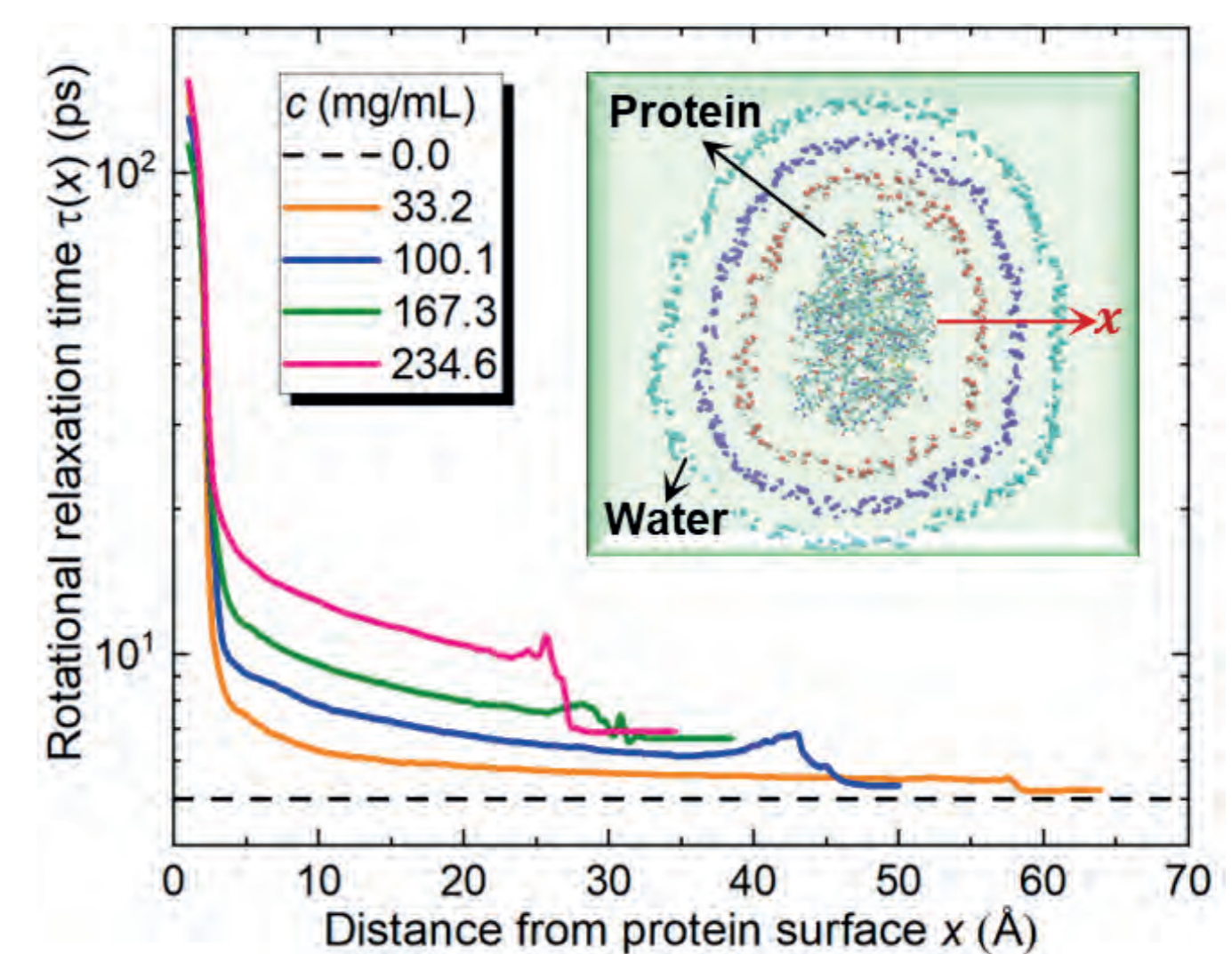
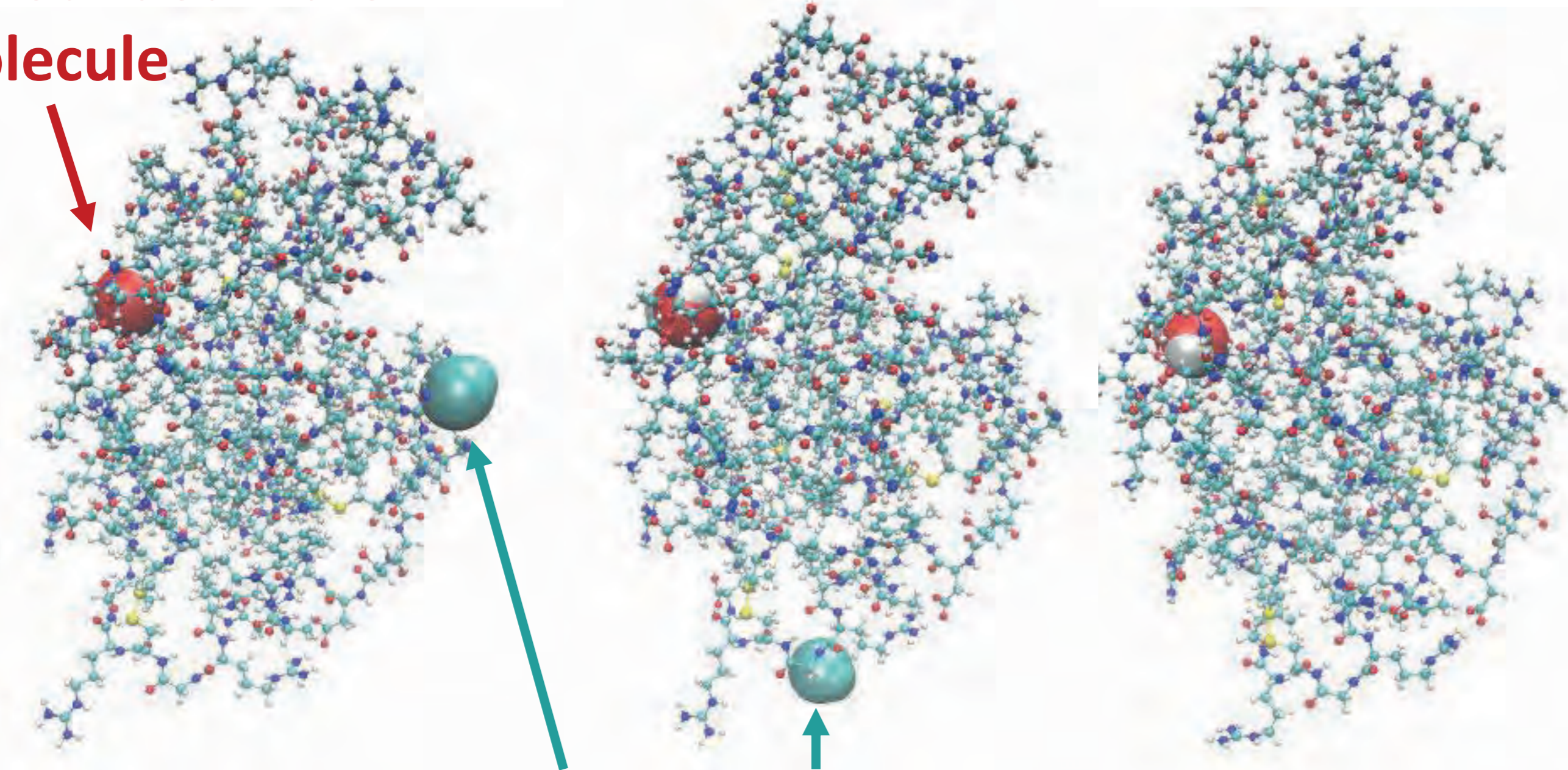
Phase Change Thermal Engineering
Department of Mechanical Engineering, Graduate School of Engineering <https://www.iis.u-tokyo.ac.jp/~aa21150/indexe.html>

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

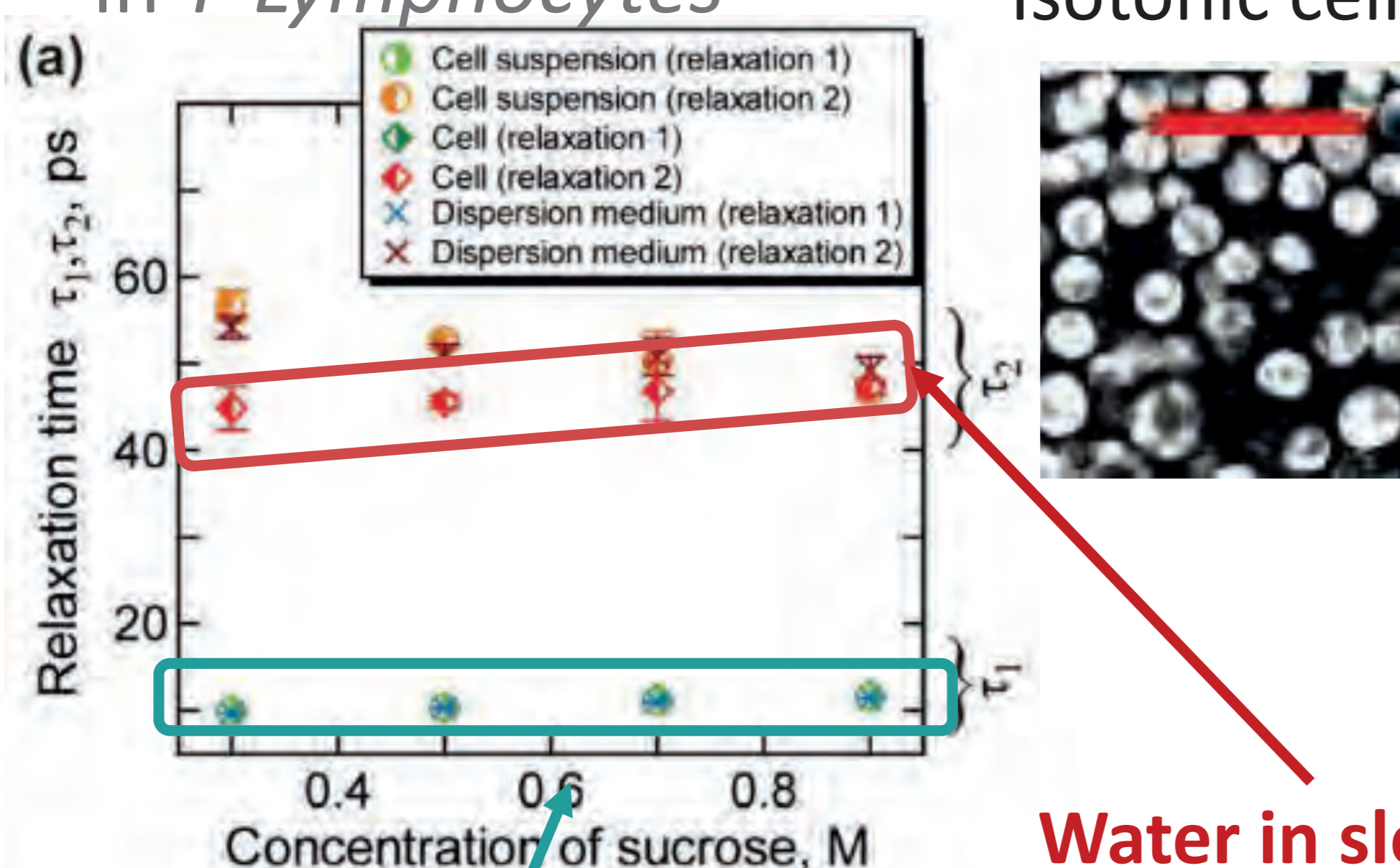
Bounded water molecule



Hu et al., JPCB, 126, 2022

2. Water bounded to dissociated

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

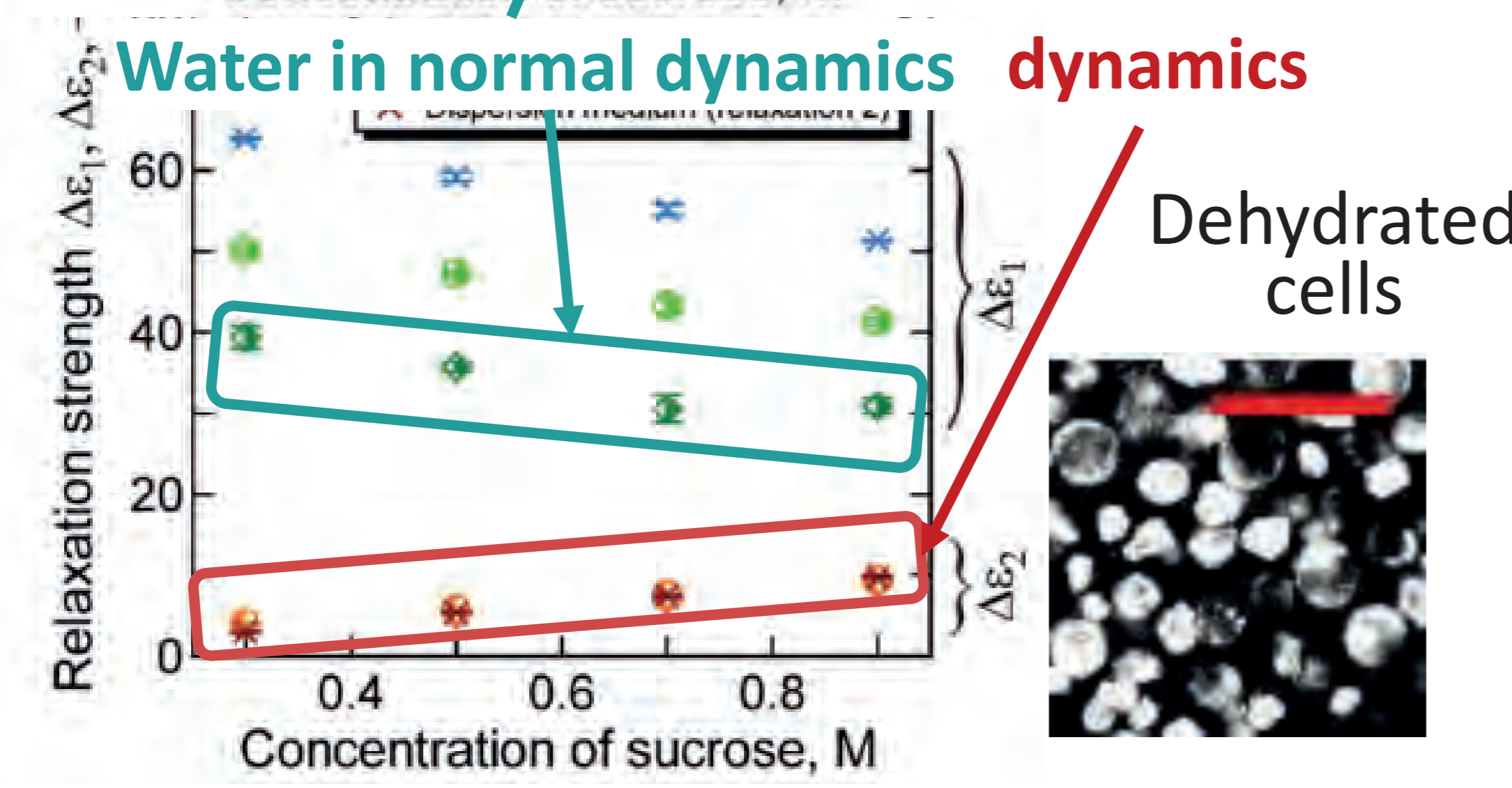


Dielectric Spectroscopy

MD Simulation

Water rotational relaxation time
Hydrogen bonding energy

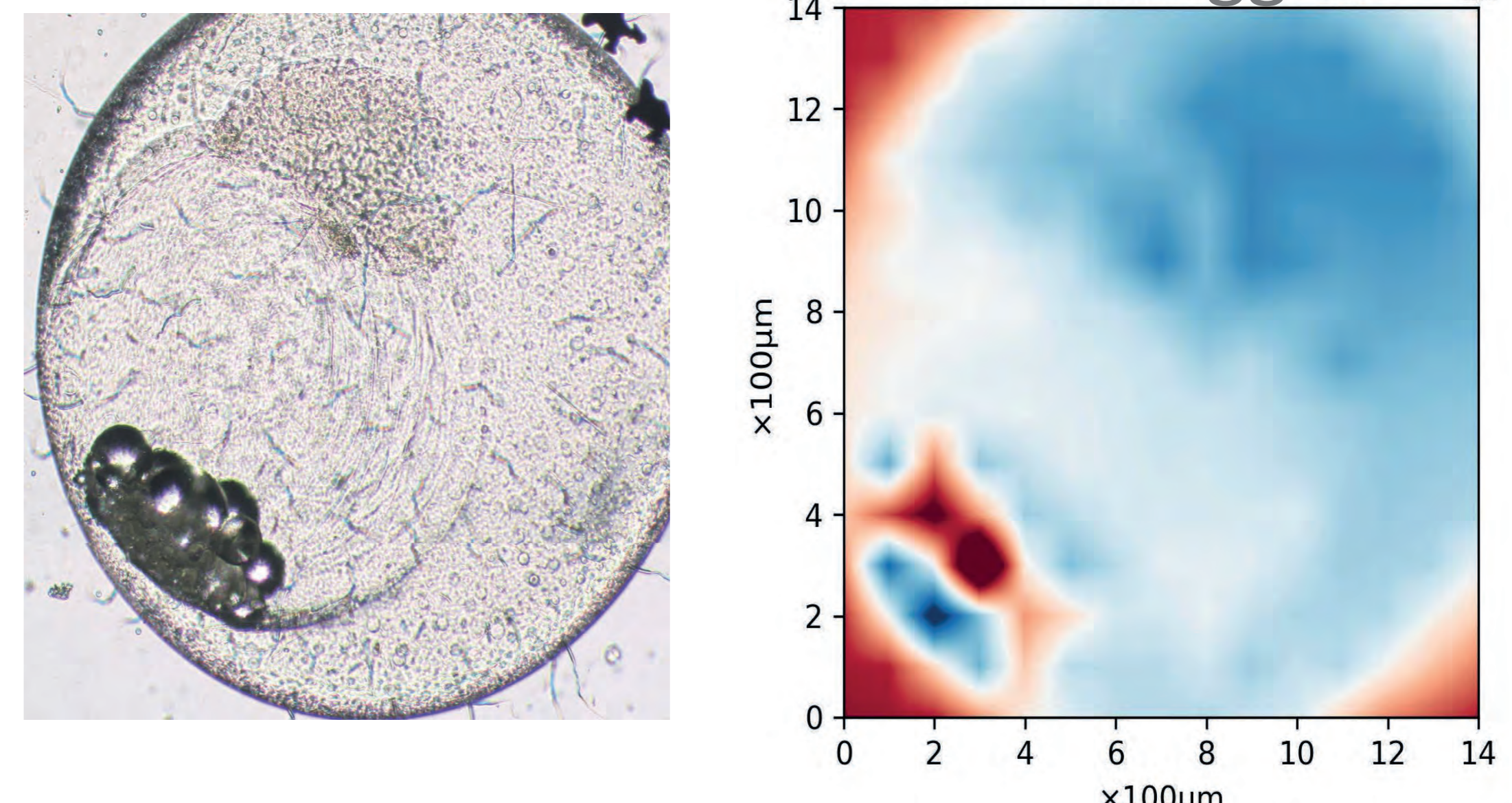
Infra-red Spectroscopy



Water in slow dynamics

Water in normal dynamics

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



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

