

# Y. SAKAI LAB.

## Construction Materials Toward the Realization of Sustainable Society

Department of Human and Social Systems

Sustainable Construction Materials Engineering

Department of Civil Engineering

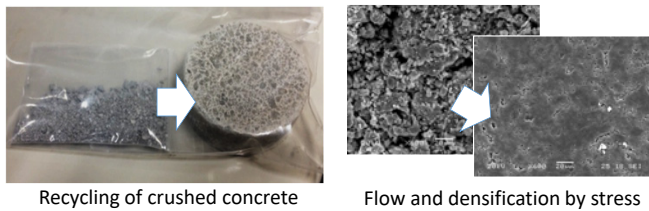
[http://r.goope.jp/ysakai/t\\_323917/free/english](http://r.goope.jp/ysakai/t_323917/free/english)

### Technology Development Toward the Sustainable Society

Our final goal is to contribute to the realization of a sustainable society through the study of construction materials, mainly concrete, to develop a sophisticated recycling system and to build long-lasting structures.

#### Complete recycling of concrete waste

We are developing a new recycling technique that produces zero by-products and does not require new materials to recycle concrete waste.

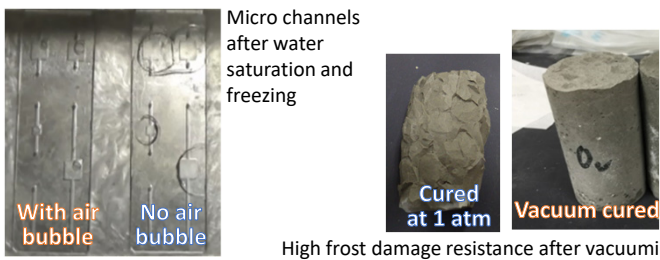


Recycling of crushed concrete

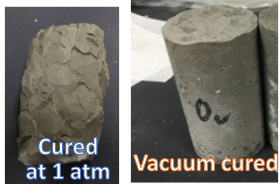
Flow and densification by stress

#### Deterioration mechanisms

We are trying to understand the deterioration mechanisms of concrete structures due to freezing and thawing, chloride attack, etc. using model channels.



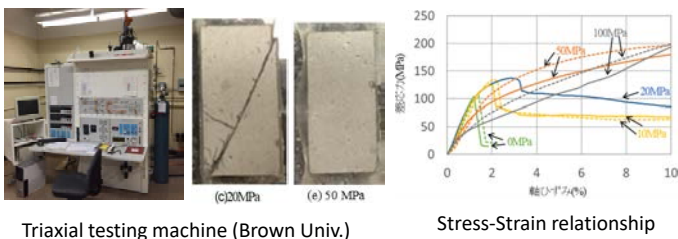
Micro channels after water saturation and freezing



High frost damage resistance after vacuuming

#### Deformation mechanism of concrete

We observed that hardened cement paste shows large deformation without macroscopic damage under confining pressure. We are trying to understand this mechanism.

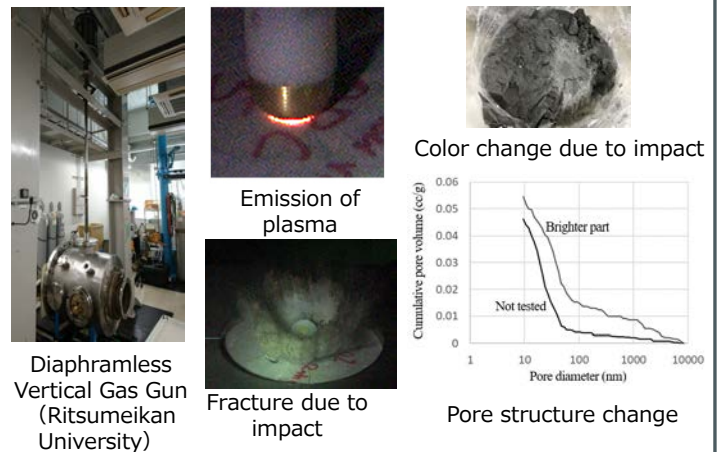


Triaxial testing machine (Brown Univ.)

Stress-Strain relationship

#### Property change due to high-speed impact

The microscopic change in concrete due to high-speed impact is not understood well. We are investigating the property change collaborating with the impact engineering laboratory in Ritsumeikan University

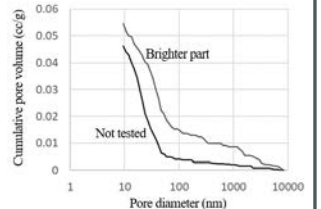


Diaphragmless Vertical Gas Gun (Ritsumeikan University)

Emission of plasma

Fracture due to impact

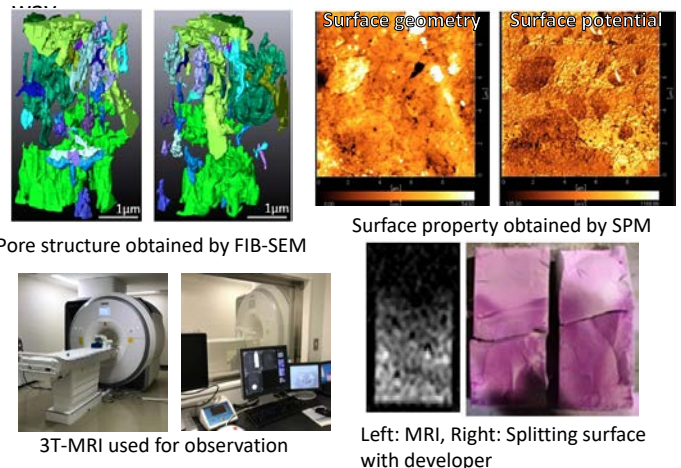
Color change due to impact



Pore structure change

#### Analysis via special devices

We use various special devices, such as FIB-SEM to observe the three-dimensional pore structure of concrete; SPM to measure microscopic surface property; and MRI to observe water permeation into concrete.



Pore structure obtained by FIB-SEM

Surface property obtained by SPM

3T-MRI used for observation

Left: MRI, Right: Splitting surface with developer