

# Y. SAKAI LAB.

## Construction Material Toward the Realization of Sustainable Society

Department of Human and Social Systems

Sustainable Construction Material 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

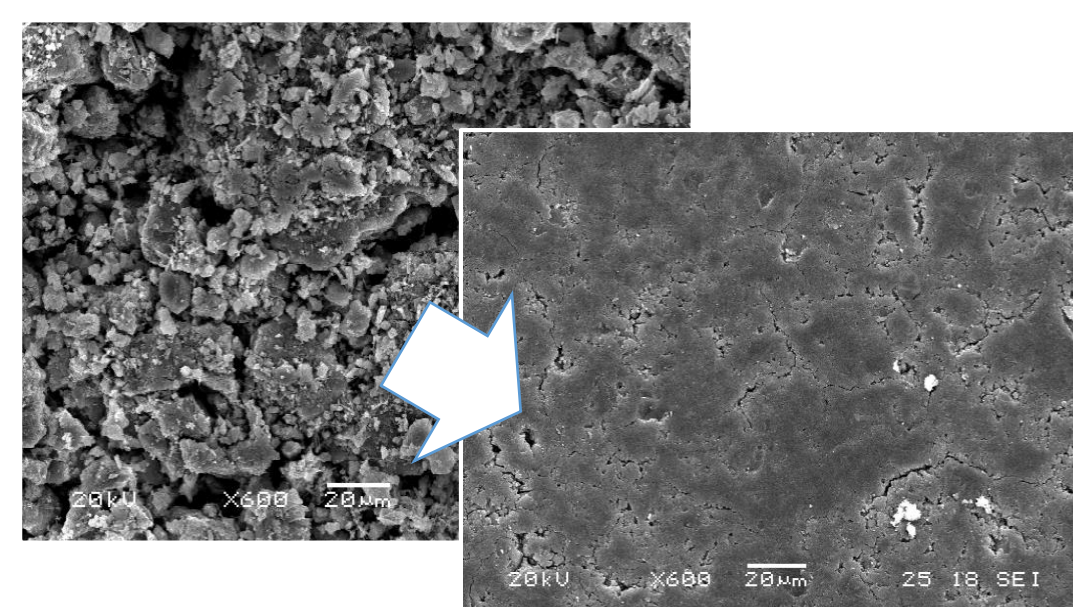
Our final goal is to contribute to the realization of a sustainable society through the study of construction materials, mainly concrete, to develop a sophisticated recycling system and to build long-lasting structures.

#### Complete recycling of concrete waste

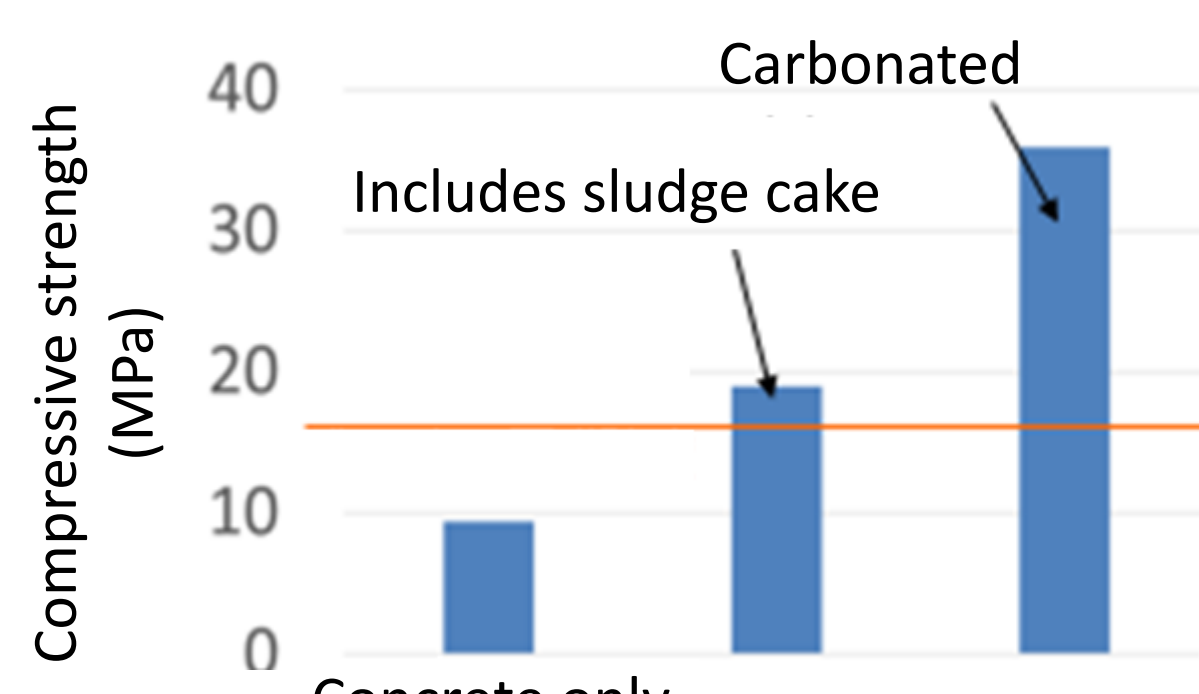
We are developing a new recycling technique that produces zero by-products and does not require new materials to recycle concrete waste.



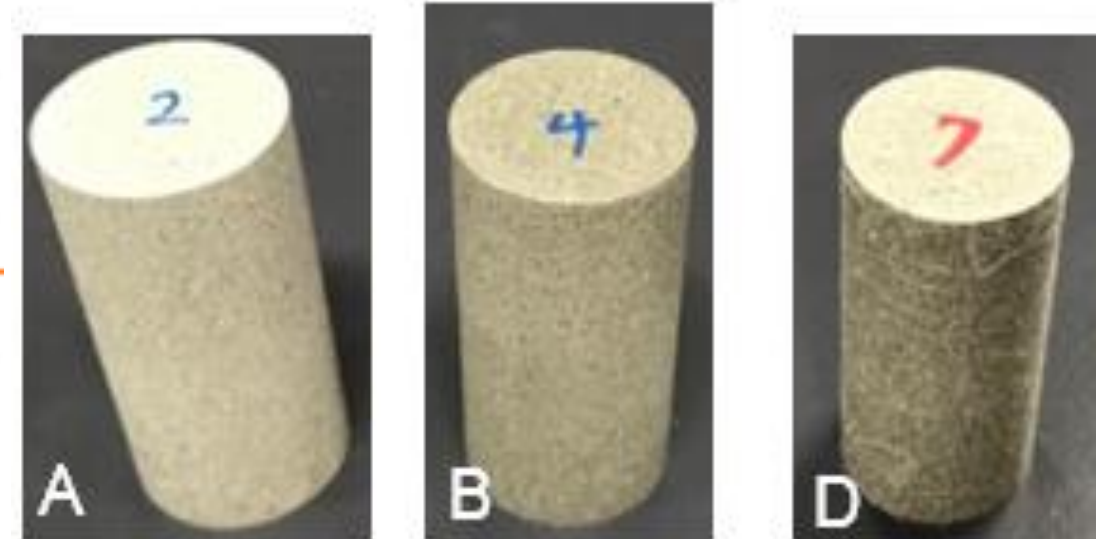
Recycling of crushed concrete



Flow and densification by stress



Strength development



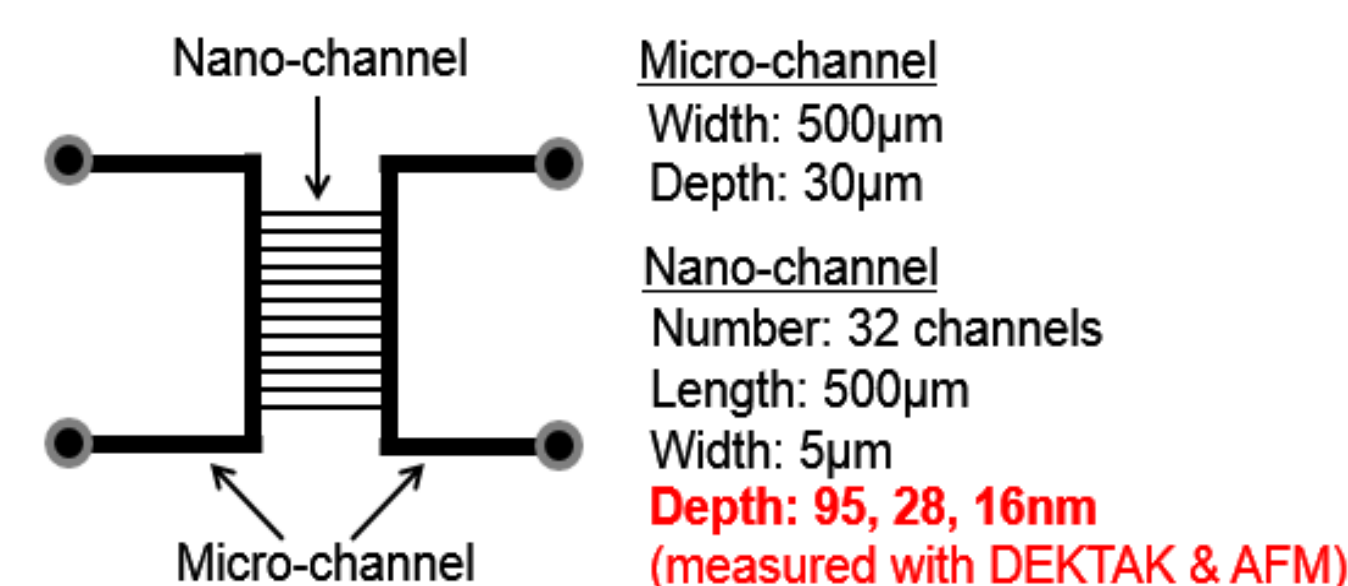
Recycled concrete samples

#### Deterioration mechanisms

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



Work in a clean room



Example of the fabricated nano-channels



With air bubble No air bubble

Micro channels after water saturation and freezing



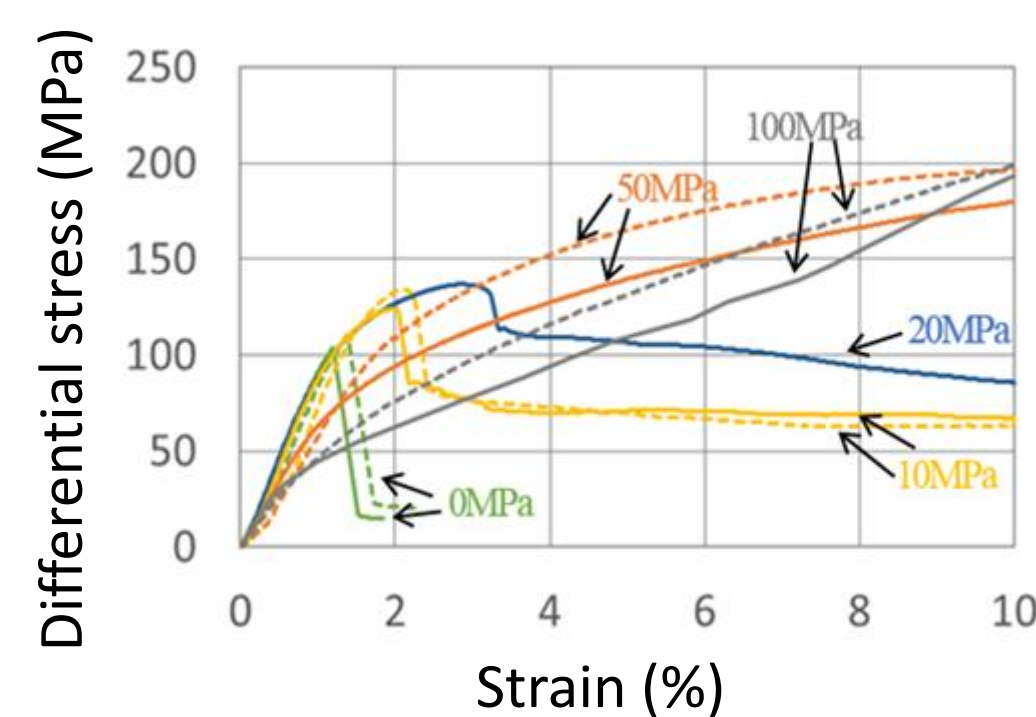
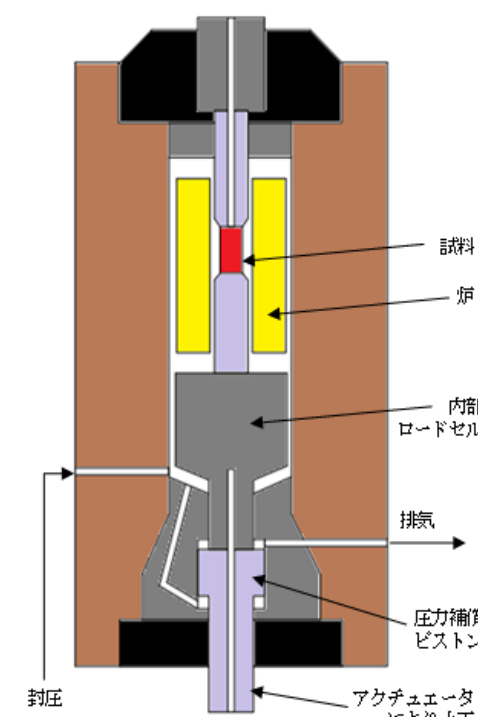
High frost damage resistance after vacuuming

#### Deformation mechanism of concrete

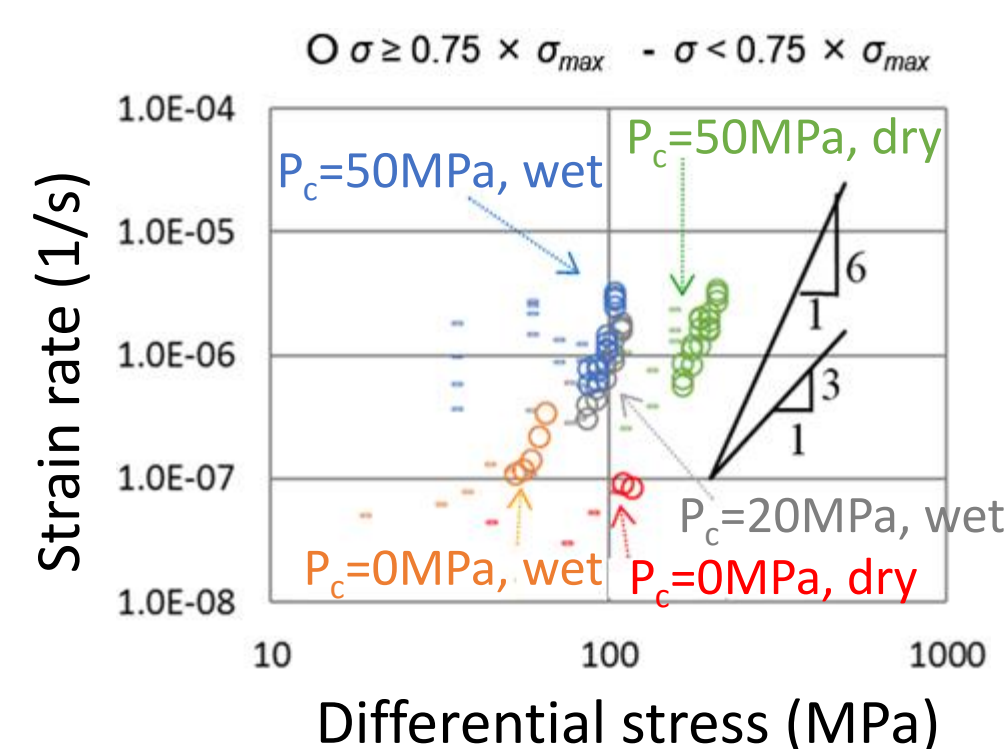
We observed that hardened cement paste shows large deformation without macroscopic damage under confining pressure. We are trying to understand this mechanism.



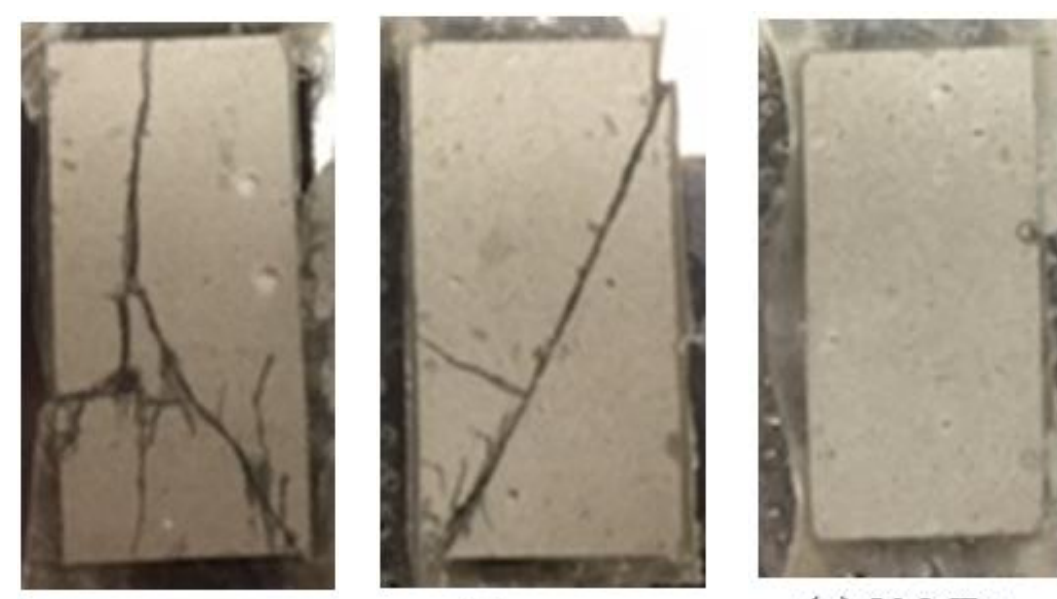
Triaxial testing machine (Brown Univ.)



Stress-Strain relationship



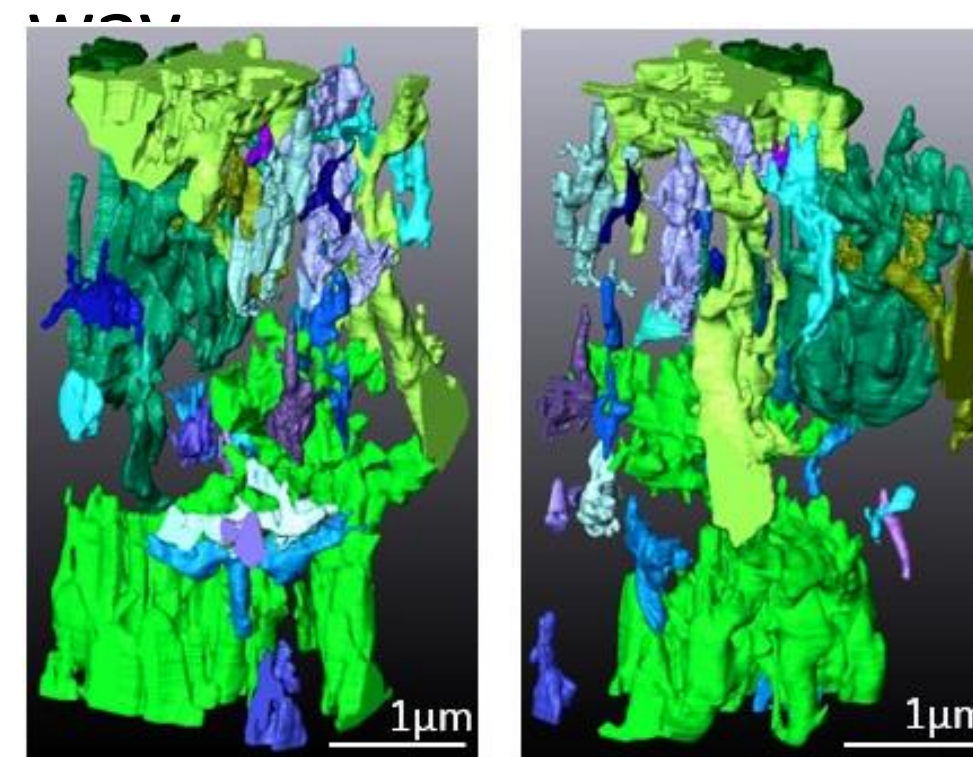
Strain rate-Stress relationship



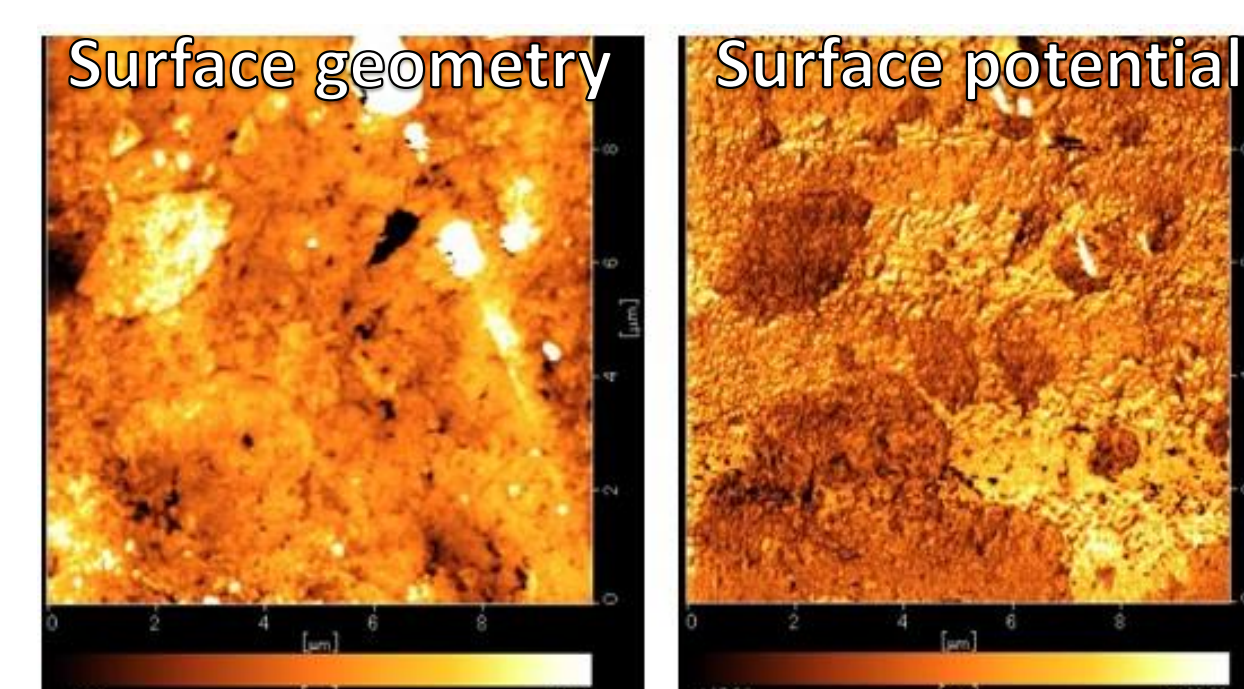
Cut surface of samples after test

#### Analysis via special devices

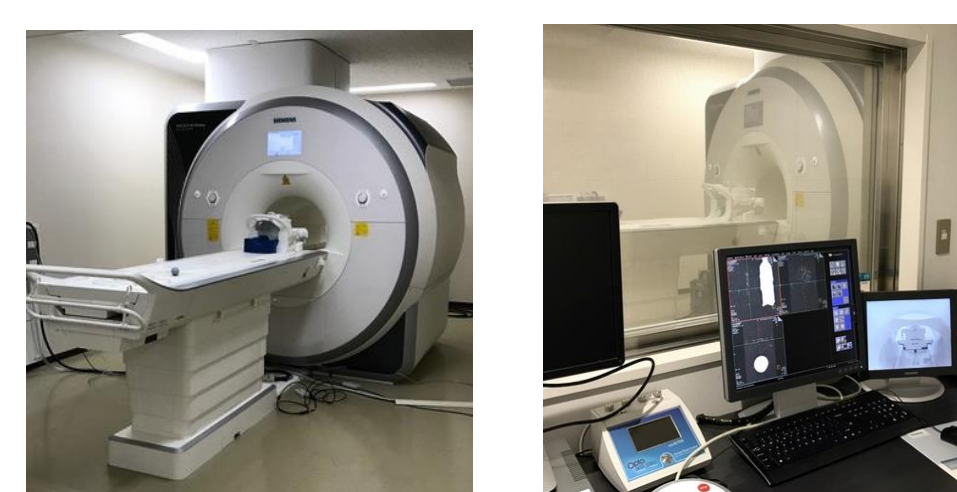
We use various special devices, such as FIB-SEM to observe the three-dimensional pore structure of concrete; SPM to measure microscopic surface property; and MRI to observe water permeation into concrete.



Pore structure obtained via FIB-SEM



Surface property obtained via SPM



Water profile imaged via MRI