Y. SAKAI LAB.

Technology Development Toward Sustainable Society

Department of Human and Social Systems

Sustainable Construction Materials Engineering

Department of Civil Engineering

http://r.goope.jp/ysakai

Technology Development Toward the Sustainable Society

Our final goal is to contribute to the development of a sustainable society through the study of construction materials, mainly concrete, to develop a sophisticated recycling system and to construct durable structures.

Botanical concrete

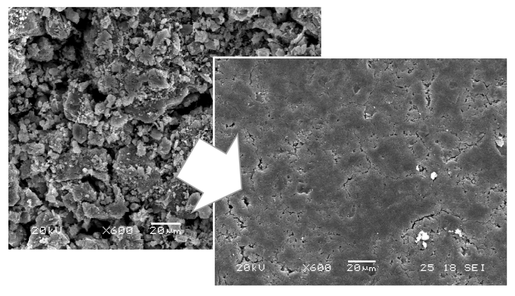
Concrete is a composite material that consists of sand and gravel bound by cement and water. Eight percent of the global CO_2 is produced by the cement industry. Currently, we are developing a new technique involving the mixture of sand and gravel with wood or plant to reduce CO_2 emission. Biodegradability, aroma, and the color of wood and plant can be enhanced in this concrete. By using this technique, we can recycle concrete waste and even produce edible construction materials.

Botanical concrete
produced from concrete and wood wastes

Recycling using compaction technique

We are developing a novel recycling technique that can be used to produce zero by-products and does not require new materials in recycling concrete waste using a compaction technique.

Recycling of crushed concrete

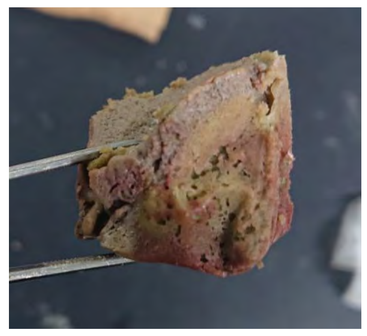


Flow and densification by stress

Direct bonding of sand and gravel

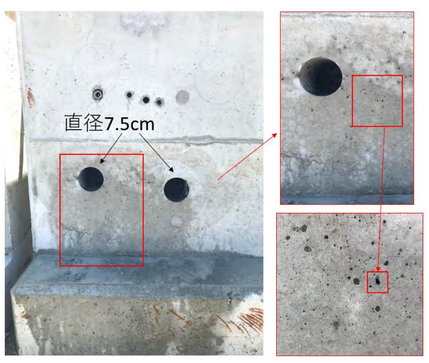
Cement paste in concrete is less durable than sand and gravel because the cement paste is porous and gradually dissolved by water. We are developing a new technique to be used for binding sand and gravel directly without adding cement paste through a catalytic reaction.

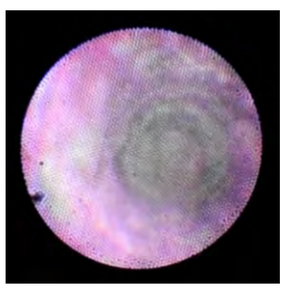
Contingence using catalyst



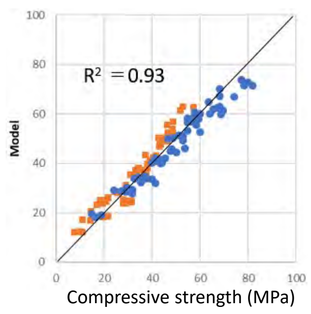
Inspection with Extremely Small Damage

We are developing techniques to evaluate compressive strength, creep, carbonation depth, frost damage etc. of concrete with very small damage less than 1 mm diameter.





Carbonation depth measurement



Compressive strength estimation

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