Y. SAKAI LAB.

[Technology Development Toward Sustainable Society]

Department of Human and Social Systems

Sustainable Construction Materials Engineering

Department of Civil Engineering

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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.

Novel Materials From Fruits and Vegetables

Enormous quantities of fruits and vegetables—both the edible and inedible parts—are disposed off worldwide. From these wastes, we have developed novel materials whose bending strength is three times higher than that of concrete. Further they retain the scent and edibility of the original foods themselves.

Orange Onion Purple potato Sea lettuce

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

Direct Bonding of Sand and Gravel

The world is running short of sand, gravel, and limestone, which are the raw materials of concrete. We are developing a new technique to direct bind sand and gravel through a catalytic reaction, without the addition of any cement paste. This technique is expected to be suitable for application in lunar bases.

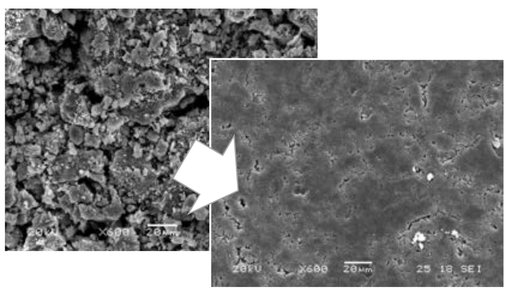
Namib desert sand

Simulated moon regolith
(Regolith from Nichireki Co. Ltd.)

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.

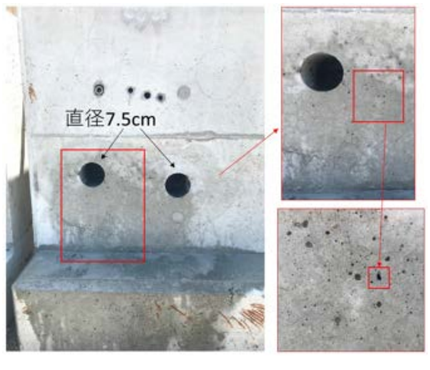
Recycling of crushed concrete

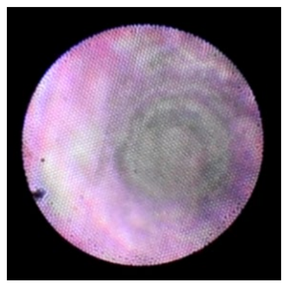


Flow and densification by stress

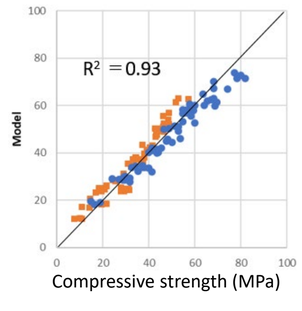
Inspection with Extremely Small Damage

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