Carbon dioxide uptake by recycling concrete rubbles

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1. Emerging expectations of construction recycling

"The 2nd fundamental plan for Establishing a Sound Material-Cycle Society" shows that establishment of a sound material-cycle society should be promoted in harmony with a low carbon society. Construction recycling has maintained a high recycling rate for the past 10 years, contributing to a sound material-cycle society. In addition to this role, construction recycling is now expected to contribute to the reduction of carbon dioxide (CO_2) emissions.

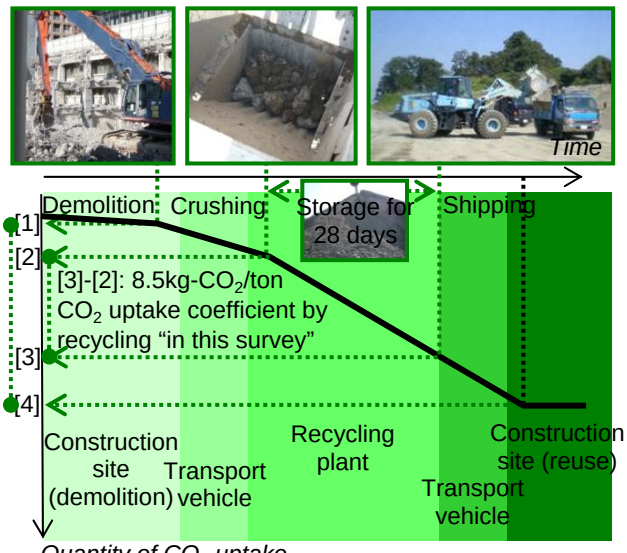
2. CO_2 uptake by recycling of concrete rubbles

Concrete rubble is the major construction waste. We have shown that recycling of concrete rubbles absorbs 8.5kg/ton of CO_2 due to neutralization (see Fig. 1). This result means 260,000 tons of CO_2 are absorbed in Japan every year through construction recycling, comparable to 40% of the CO_2 absorbed by restoring urban vegetation. The CO_2 emissions coefficient of recycled concrete aggregates is much lower than that of natural crushed stone.

3. Current Research

Road construction works have maintained sufficient capacity to accept all the recycled concrete aggregates. However, future recycle is anticipated to be difficult because of increasing old buildings and decreasing construction demand. Then efforts will be made to develop new recycling uses of concrete rubble. In order to continue contributing to the low carbon society, a CO_2 uptake coefficient based on new uses should be evaluated. We have started to examine the CO_2 uptake coefficients regarding new recycling uses.

We have also started to develop an on-site method of estimating the CO_2 uptake coefficient quickly and easily because the CO_2 uptake coefficient will vary according to the recycling method even if recycling use remains the same. We focus on the color distribution of concrete rubble which appears when a pH indicator (phenolphthalein (PP)) is sprayed. PP has been widely used to check the durability of concrete structures. We found that the color of the concrete specimen is distributed in a specific manner (see Fig. 2) and is related to the quantity of CO_2 uptake.



[4]-[1]:CO_2 uptake coefficient by recycling "in the ordinary sense"

Figure 1. Present CO_2 Uptake Coefficient by Recycling of Concrete Rubble

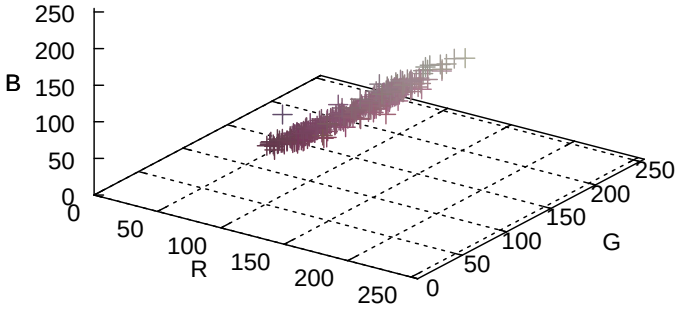


Figure 2. Example of RGB Distribution of Concrete Specimen by PP Reagent

(Note) RGB: Indices of the strength of red (R), green (G) and blue (B) which are the three primary colors of light. Here the scale from 0 to 255 which is widely used for image processing is applied.