

◆ Concrete is the most widely used material in the world, the utilization is said second only to water

◆ Portland cement is the main component in concrete. Production of Portland cement has caused several negative impact to the environment:

1. CO<sub>2</sub> emission  
(1 ton OPC → 1 ton CO<sub>2</sub>)
2. High consumption of raw material  
(2 tons raw → 1 ton OPC)
3. High energy demand  
(1 ton OPC → 4 GJ energy)
4. Hazardous air contaminant  
(1 ton OPC → 3 kg NOX & 0.4 kg PM10)



◆ The Paris Agreement, which came into effect in November 2016, calls for further CO<sub>2</sub> reductions.

◆ The biggest feature of zero cement → can significantly reduce CO<sub>2</sub> emissions (80% reduction)

◆ Definition of zero cement: "Does not use cement clinker, has the same performance as cement and is hardened using a raw material based on industrial waste and a small amount of alkali stimulant"

The purpose of this study is to conduct research on the following items:

(1) Development of ultra high strength zero cement mortar:

The purpose of this study is to develop ultra high strength zero cement mortar more than 100MPa.

(2) Elucidation of the influencing factors and mechanism of ultra-high strength zero cement mortar:

The purpose of this study is to clarify the factors affecting the compressive strength of ultra-high strength zero cement mortar, study the reaction products and pore structure, and elucidate the mechanism of the ultra high strength zero cement.

(3) Proposal of design method for ultra high strength zero cement mortar:

A technology that enables the production of the ultra-high strength zero cement mortar using different source materials is important. Proposing a method for designing ultra-high strength zero cement mortar by evaluating active ingredients in raw materials such as fly ash, blast furnace slag, shirasu and metakaolin.