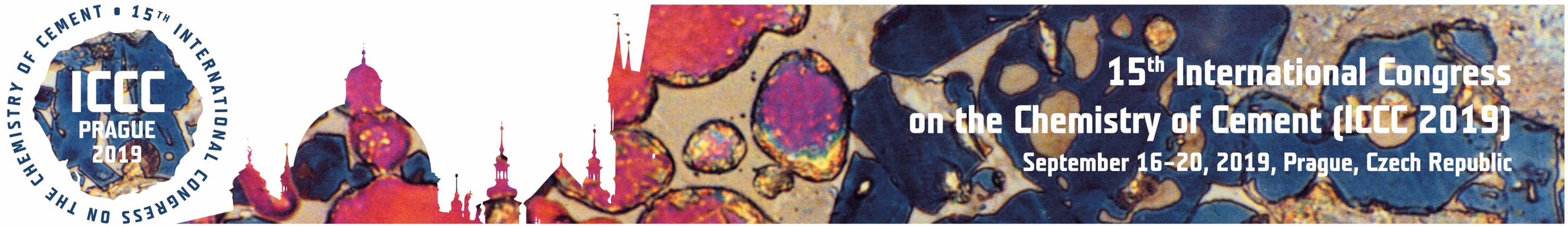

Investigation for durability of mortar using Dry Sludge Powder

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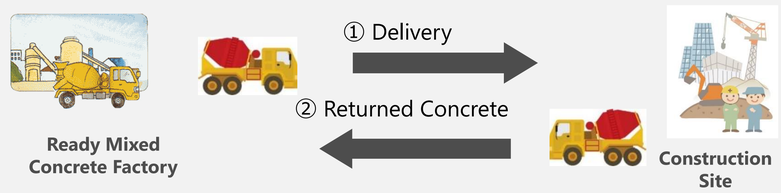
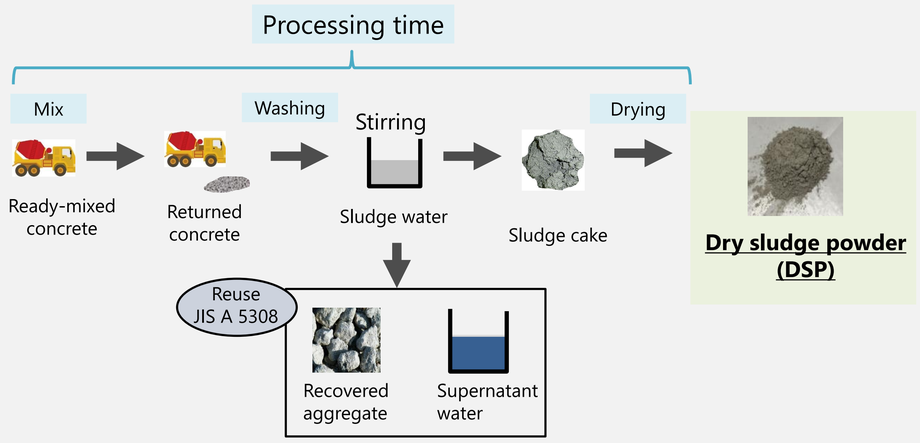
Introduction

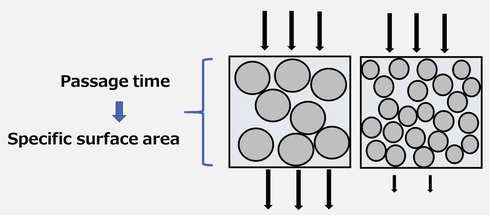
All industry is required reducing environmental impacts. In Construction industry and ready-mixed concrete industry, it is problem to occur returned concrete. The annual amount of returned concrete is 1.5 million to 2 million m³, it converted to an agitator cars from 300 to 400 thousand. Therefore, a method of using DSP obtained by drying the sludge cake as cement has been studied. At present it is not yet studied about characteristics and durability of DSP. Therefore, in this study, characteristics of DSP were examined by analyzing chemical composition of DSP. Furthermore, we aimed to clear the durability of mortar using only DSP with different processing time.





Investigated about characteristics of DSP

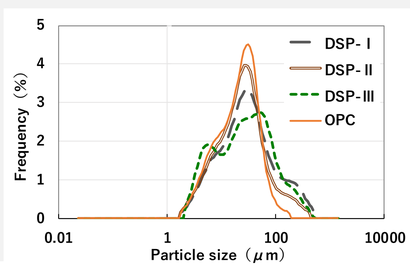
Outline
The specific surface area of the DSP is larger than that of general OPC. However, DSP does not perform processing such as fine grinding. Consider why a large specific surface area is measured.

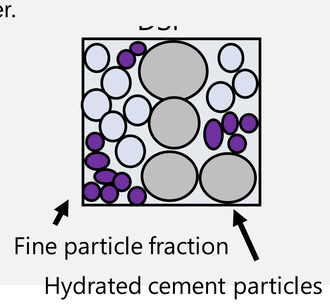


	DSP-Ⅰ	DSP-Ⅱ	DSP-Ⅲ
Processing Time（h）	2.5	4	12
Specific Surface Area（cm²/g）	6030	6070	10590
Density（g/cm²）	2.91	2.74	2.46

Passage time	Short	Long
Specific surface area	Small	Big

Result
When the specific surface area became larger, the peak of the particle of 100 μm became larger. From the above results, it is conceivable that DSP is not a uniform particle diameter.





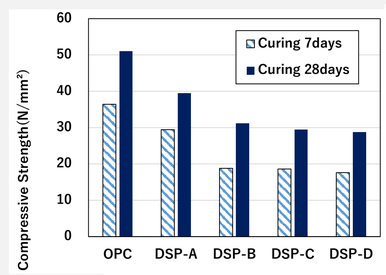
Investigated about strength and durability using mortal

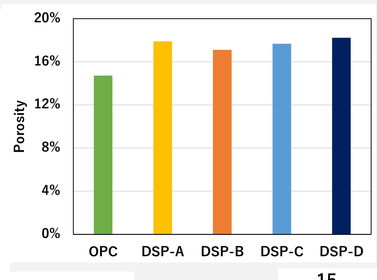
Outline
Mix proportion was 1: 3 mortar with reference to the cement strength test of JIS R 5201, demolished on the date of injection and sealed curing was carried out for 28 days in a constant temperature and humidity environment (temperature 20 degree Celsius, humidity RH60%).

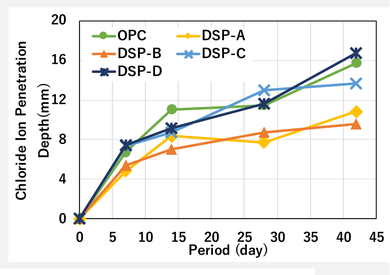
Methodology of testing
- Strength test
- Pore measurement test
- Mercury intrusion test
- Salt water immersion test
- Water permeability test

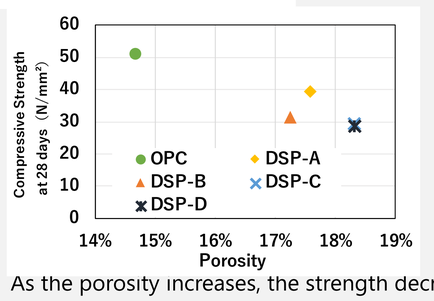
	DSP-A	DSP-B	DSP-C	DSP-D
Processing Time（h）	5	9	12	24
Specific Surface Area（cm²/g）	7410	8920	10590	11400
Density（g/cm²）	2.81	2.58	2.46	2.45

Result

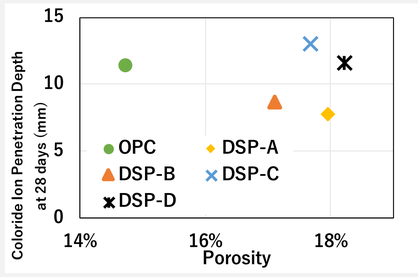




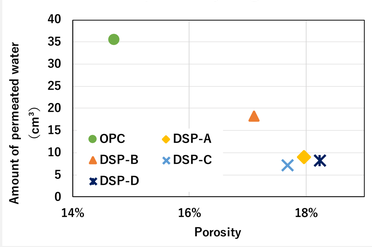


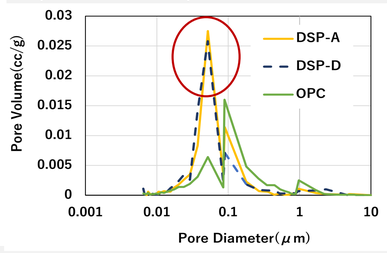


Different



- As the porosity increases, the strength decreased
- As porosity higher, chloride ion penetration depth is smaller





Mortar using DSP
- High porosity
- Low water permeability
- There are many small pore

The mortar using DSP has many small pores, the pore structure is complicated

Conclusion

1. In the mortar using DSP, the depth of chloride ion penetration was smaller than that of OPC, and there was no correlation with porosity.
2. As a result of carrying out the permeability test, mortar using DSP was lower in moisture permeability than mortar using OPC.
3. Since mortar using DSP has more minute pore than mortar using OPC, it can be predicted that the pore network in mortar becomes complicated. Also, a large number of minute pore were measured which has a structure in which liquid hardly intrudes into the mortar.
4. It is considered that the mortar using DSP has a structure in which the liquid hardly intrudes into the mortar, so that the moisture permeability is greatly reduced and the depth of penetration of the salt has decreased.
5. We will consider the cause of the complexity of the pore structure focusing on the hydration reaction as a future work.

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