

Test Summary

Oxychloride Expansion (via LT-DSC)

Test

AASHTO T365-17

Objective

Determine the amount of calcium oxychloride that may form in a cement paste sample from exposure to deicing salt

Time to Complete Test

10 hours

Summary

Calcium hydroxide in cement paste reacts with chloride in some deicing salts to form expansive calcium oxychloride. The test is useful to assess the effects of water-cement ratio, cement content, supplementary cementitious materials, salt, and aging time on the amount of calcium oxychloride that is likely to form in a specific cement paste sample. By determining this amount, measures can be implemented to deal with the issue of oxychloride expansion.

The heat needed for calcium oxychloride phase change in the paste sample is compared with the heat needed for pure calcium oxychloride phase change. From this ratio, the amount of calcium oxychloride present in the paste sample can be calculated.

Procedure

1. A salt solution is prepared with 1 part salt (CaCl_2) and 5 parts water.
2. A cement paste sample is prepared according to ASTM C305 and cured for 3 days at 23°C and then for 25 days at 50°C .
3. Equal amounts (10 ± 0.5 mg) of ground sample and salt solution are added to a steel pan containing an O ring. The pan is sealed and placed in the LT-DSC test chamber.
4. The pan is subjected to temperature of 25°C for 50 to 60 minutes. The temperature is cooled to -90°C , increased to -70°C , and then cooled again to -90°C at a constant rate of 3°C per min in a cycle.
5. At a rate of 0.25°C per min, the heat is increased to 50°C . LT-DSC readings are entered into the LT-DSC software.

The heat flow data from the LT-DSC software is used to obtain the heat absorbed during phase transformation. The amount of calcium oxychloride (M_{oxy}) per 100 g of cement paste is determined as follows:

$$M_{\text{oxy}} = (\Delta H / L_{\text{oxy}}) \times 100$$

Where,

ΔH = Heat absorbed during calcium oxychloride phase change during the test, J/g

L_{oxy} = Specific latent heat of pure calcium oxychloride phase change, 186 J/g

The presence of 15 g of calcium oxychloride in 100 g of cement paste can be cause for concern.

For More Information

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