

## **Influence of Silica Fume on the Hydration of Cement Pastes Studied by Simultaneous TG-DSC Analysis**

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**Abstract :** Silica fume is a by-product of the ferro-silicon and silicon metal industries. It is mainly in the form of amorphous silica. Silica fume belongs to pozzolanic active materials which can be used in concrete to improve its final properties. In this paper, the influence of silica fume on hydration of cement pastes is studied using differential scanning calorimetry (DSC) and thermogravimetry (TG) at various curing times (2, 7, 28, and 90 days) in the temperature range from 25 to 1000 °C in an argon atmosphere. Samples are prepared from Portland cement CEM I 42.5 R which is partially replaced with the silica fume of 4, 8, and 12 wt.%. The water/binder ratio is chosen as 0.5. It is identified and described the liberation of physically bound water, calcium-silicate-hydrates dehydration, portlandite and calcite decomposition in studied samples. Also, it is found out that an exothermic peak at 950 °C is observed without a significant mass change for samples with 12 wt.% of silica fume after two days of hydration. This peak is probably caused by the pozzolanic reaction between silica fume and Portland cement. Its size corresponds to the degree of crystallization between Ca and Si. The portlandite content is lower for the samples with a higher amount of silica fume.

**Keywords :** differential scanning calorimetry, hydration, silica fume, thermogravimetry

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