

APPLICATION SHEET

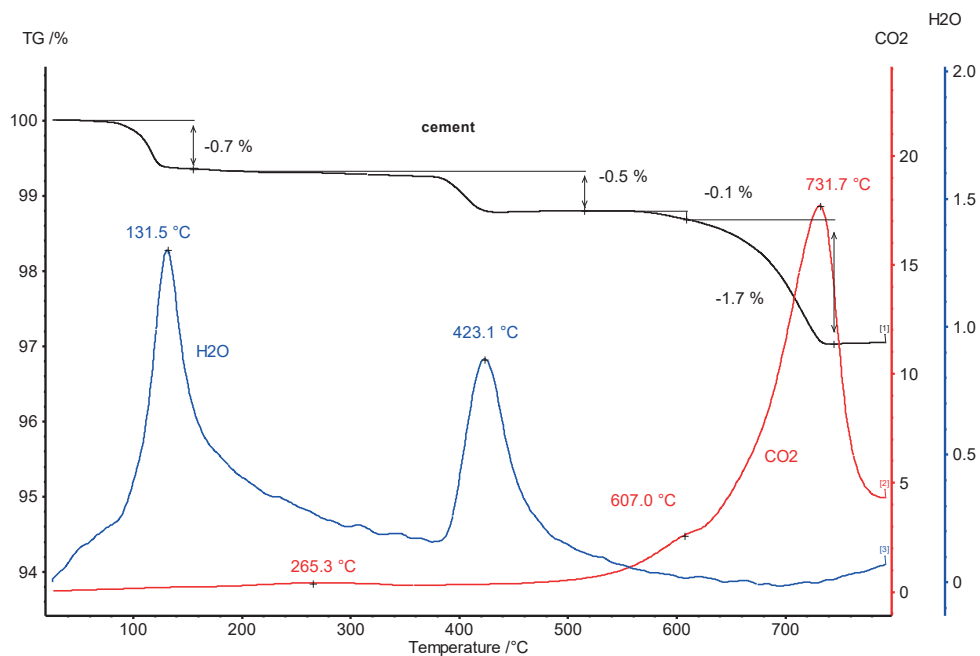
Inorganics · Building Materials
TG 209 **F1 Libra**® - FT-IR

Cement

Introduction

Portland cement is produced by heating of limestone with clay and/or sand up to about 1480°C. To the resulting clinker, 4-5% gypsum is mixed and then grinded and milled to a fine grain size of approx 10 µm. The additives gypsum,

anhydrite, etc., influence the setting time of the cement. Impurities in the raw material can have a negative influence on the quality of the cement. Magnesia, i.e., causes expansion and deterioration of cements on long exposure, and its presence of more than 5% is not desirable.



Test Conditions

Temperature range:	RT ... 800°C
Heating rate:	10 K/min
Atmosphere:	Air (40 ml/min)
Sample mass:	43.6 mg
Crucible:	Pt/Rh with lid
Sensor:	TGA-DSCtype S

Test Results

With thermoanalytical methods, the components (additives) of cement can be identified and quantified. The combination of thermogravimetry with an evolved gas analysis method (i.e., mass spectrometry or Fourier transform infrared spectroscopy) is a very powerful method since the evolved gases can be identified. The water evolved from the CaSO_4 di-hydrate and hemihydrate (1st TGA step) and $\text{Ca}(\text{OH})_2$ (2nd TGA step) can be verified by FT-IR analysis. The decomposition of carbonates (calcite, dolomite) is found in the temperature range between 600°C and 750°C. The MgCO_3 amount of the dolomite decomposes before CaCO_3 and is also seen as a shoulder in the CO_2 trace of the FT-IR signal.