

APPLICATION SHEET

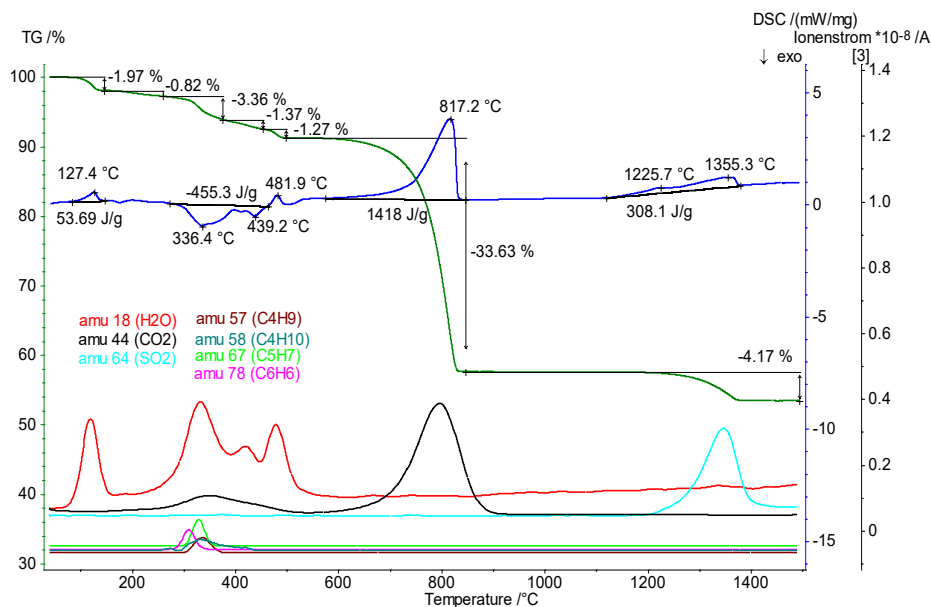
Ceramics · Building Materials
STA 449 C Jupiter® - QMS 403 Aëolos®

Cement Raw Material

Introduction

Building materials such as bricks or cement are classical application fields for thermal analysis coupled to mass spectroscopy. Cement raw materials are mostly complex mixtures of ceramic components like gypsum and calcium

carbonate. Organic components, however, can also be present. Thermal analysis along with mass spectroscopy enables on the one hand to investigate and to quantify the different components of the raw material and also features a tool for the simulation of the manufacturing process of the later building material on the other.



Test Conditions

Temperature range: RT ... 1500°C
Heating rate: 10 K/min
Atmosphere: Synthetic air at 70 ml/min
Sample mass: 16.06 mg
Crucible: Pt with pierced lid
Sensor: TGA-DSC type S

Test Results

Using simultaneous thermogravimetry (TG), differential scanning calorimetry (DSC) and mass spectroscopy (MS), a cement raw material was studied. Upon heating to 1500°C,

several mass-loss steps along with endothermal and exothermal effects were observed. The mass spectrometer signals allow for identification of the evolved gases and thus of the components of the cement raw material. H₂O was released most probably from gypsum at low temperatures and from Ca(OH)₂ at ~480°C. In the temperature range between ~300°C - 400°C, organic components were partially decomposed and burned which can be concluded from the mass spectrometer signals as well as from the exothermal DSC peaks. At ~800°C, the evolution of CO₂ indicates the decomposition of CaCO₃ while SO₂ indicates the decomposition of CaSO₄ at highest measuring temperatures.