

APPLICATION SHEET

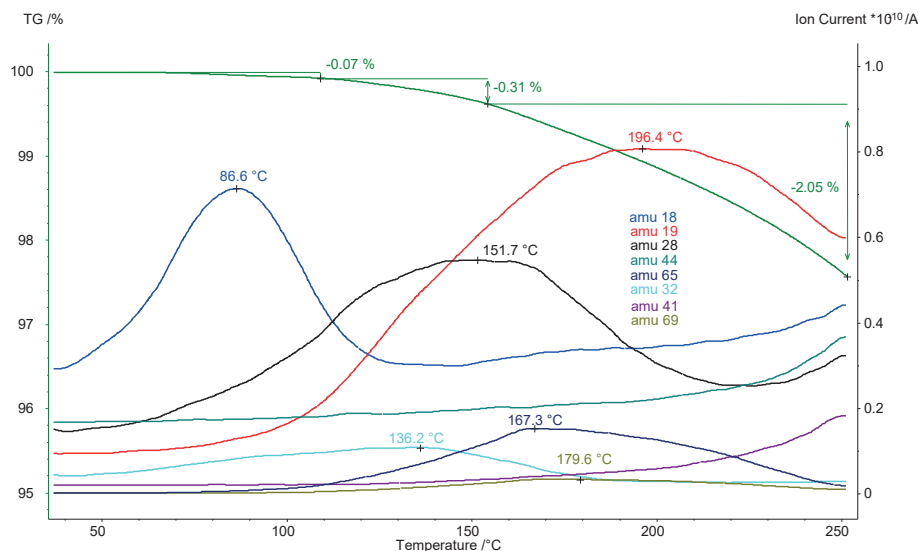
Building Materials · Chemistry
STA 449 F1 Jupiter® – QMS 403 Aëolos

Blowing Agents in Insulation Materials (Foam)

Introduction

Insulation materials like foams are found in many applications like the insulation of houses and roofs, refrigerators, freezers, etc. Blowing agents, which are often also called foaming agents, play an important role for the main properties of the insulation material. These properties and

requirements concern – along with thermal conductivity – low flammability, low toxicity and high load bearing capability. In addition, the use of some chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) as blowing agent is prohibited or should be avoided because of ozone depleting potential and global warming.



Test Conditions

Temperature range: RT ... 250°C
Heating/cooling rates: 10 K/min
Atmosphere: Argon (70 ml/min)
Sample mass: 180 mg
Crucible: Al₂O₃ beaker
Sensor: TGA, type S

Test Results

An insulation material (foam) was studied using simultaneous thermogravimetry (TGA) and mass spectroscopy (MS). During the entire measurement, three mass-loss steps of 0.07%, 0.31% and 2.05% were observed. The last

mass-loss step was not completed because of the beginning decomposition above ~230°C which was not the main issue of the test. Below ~100°C, the ion current for mass number 18 indicates the release of water (surface humidity). The broad peaks for mass numbers 28 and 32 at 152°C and 136°C reflect the release of the blowing agents N₂ and O₂. Mass numbers 19, 65 and 69 are due to the F-containing blowing agent (HCFC) while the increase in mass numbers 41 and 44 at highest temperatures is due to the beginning decomposition of the foam sample. In general these results demonstrate the suitability of coupled TGA-MS for the study of blowing agents in insulation materials and their thermal stability.