

APPLICATION SHEET

Organics · Chemistry
STA 409

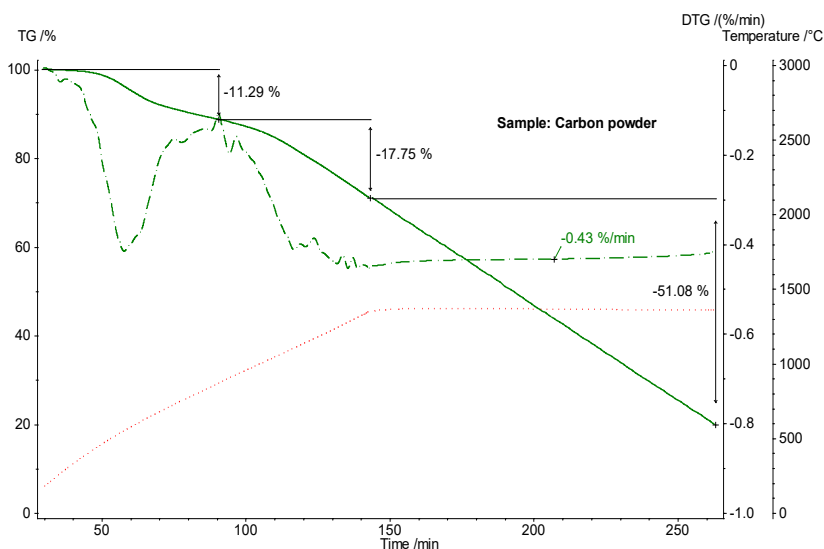


Gasification of Carbon under a Humid Atmosphere

Introduction

The gasification process occurs as char reacting with carbon dioxide and steam to produce carbon monoxide and hydrogen. The resulting gas is called producer gas or syn-gas (or wood gas when fuelled by wood) and may be more efficiently converted to energy such as electricity than would be possible by direct combustion of the fuel. The gasification process was originally developed in the

1800s to produce town gas for lighting and cooking. Natural gas and electricity soon replaced town gas for these applications, but the gasification process has been utilized for the production of synthetic chemicals and fuels since the 1920s. It is now recognized that gasification has wider applications: in particular the production of electricity, ammonia and liquid fuels (oils) using Integrated Gasification Combined Cycles, with the possibility of producing methane and hydrogen for fuel cells.



Test Conditions

Temperature range: RT ... 1360°C
Heating rate: 10 K/min
Atmosphere: Ar/H₂O at 150 ml/min
Sample mass: 42.48 mg
Crucible: TGA plate, Al₂O₃
Sensor: TGA type S

Test Results

Carbon powder was heated up to 1360°C and kept isothermal for 2 hours. The measurements were carried out under a humid atmosphere. At high temperatures, the

sample mass (TGA) decreases linearly at a mass-loss rate (DTG) of 0.43%/min. This mass loss is due to gasification which is a reaction of carbon powder with water vapor into carbon monoxide and hydrogen. In a humid atmosphere up to 100%, absolute concentration can be created by a special water vapor furnace which can also be coupled to evolved gas analysis. Typical further application fields of humid atmospheres are corrosion and scaling processes on steels, where the oxidation and decarbonisation by means of the water vapor is especially important. The same applies to the study of sintering processes in ceramic components. Also inorganic building materials are often investigated in humid atmospheres.