

# APPLICATION SHEET

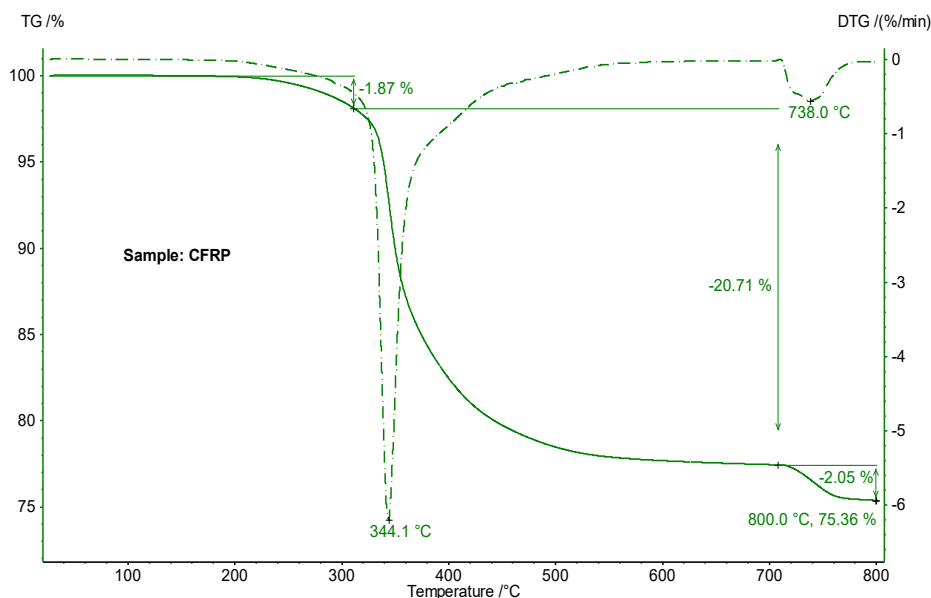
Polymers · Manufacturing & Processing  
STA 409

## Fiber-Reinforced Plastics (GFRP/CFRP)

### Introduction

Glass or carbon fiber-reinforced plastics (GFRP or CFRP) are strong, light and tailored composite materials similar to glass-reinforced plastic which is sometimes simply called fiberglass. The plastic is often epoxy but other plastics such as polyester, vinylester or nylon are also sometimes used. Some composites contain both carbon fiber and fiberglass reinforcement. Less commonly, the term

graphite-reinforced plastic is also used. Fiber-reinforced plastics have many applications in the aerospace and automotive fields as well as in sailboats, and notably in modern bicycles, where these qualities are of importance. It is also becoming increasingly common in small consumer goods such as laptops, tripods, fishing rods, racket sports frames, stringed instrument bodies, classical guitar strings and drum shells.



### Test Conditions

Temperature range: RT ... 899°C  
Heating rate: 10 K/min  
Atmosphere: N<sub>2</sub>/O<sub>2</sub> at 75 ml/min  
Sample mass: 698.46 mg  
Crucible: Al<sub>2</sub>O<sub>3</sub> beaker  
Sensor: TGA type S

### Test Results

In the temperature range below 700°C, a fiber-reinforced plastic material was measured in a dynamic nitrogen atmosphere. The two mass-loss steps of 1.87% and 20.71%

reflect the pyrolytic decomposition of the epoxy content. At 700°C, the gas atmosphere was switched to dynamic oxygen atmosphere which lead to the burn-up of the carbon content. The residual sample mass of 75.36% is most probably due to glass fibers and inorganic flame retardants. A TG sample carrier together with a large beaker crucible allows to measure large samples (currently approx. 700 mg) which are possibly inhomogeneous. The large size of the measured sample then yields more representative results. This measurement demonstrates the possibility of identifying and quantifying polymers and other sample components like carbon and inorganics with an STA apparatus. The latter enables to measure large samples of several cm<sup>3</sup> in size.