

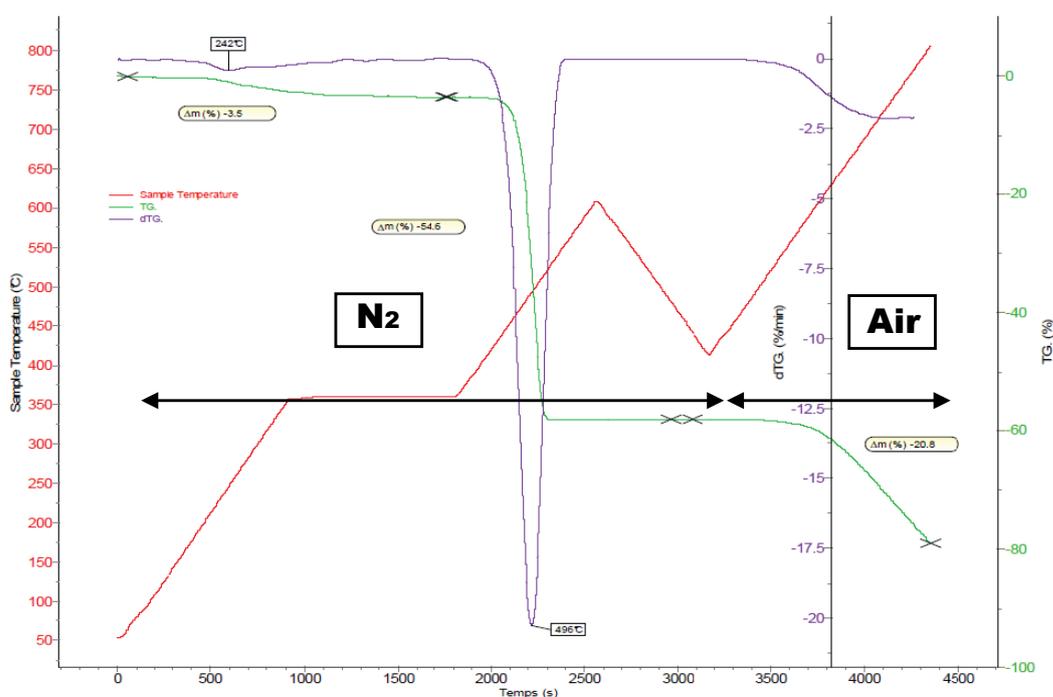
## Compositional analysis of rubber by TGA

### INTRODUCTION

The generic type of rubber, its composition (plasticizer/oil, polymer, carbon black, filler content) and the type of filler can be determined using different techniques and especially the thermogravimetric method.

TGA can be carried out in accordance with the following standards:

- ASTM D6370 Standard Test Method for Rubber-Compositional Analysis by Thermogravimetry (TGA)
- ASTM E1131 Standard Test Method for Compositional Analysis by Thermogravimetry The THEMYS ONE TGA is very well adapted for performing the compositional analysis of rubber.



### EXPERIMENT

The compositional analysis is obtained from the thermogravimetric test that is used to determine the amounts of organics (oil, polymer), carbon black and ash (filler) in a rubber compound. The test has to be performed firstly under nitrogen to decompose the organic matter and then under oxygen to burn the carbon content. The following experimental procedure has to be used:

- Place a small piece (40 mg) of the rubber sample into the alumina crucible
- Apply a nitrogen flow rate (60 ml/min)
- Heat to 50°C and allow the instrument to equilibrate for a minimum of 2 minutes
- Heat from 50°C to 350°C at 20°C/min
- Stabilize at 350°C during 15 minutes
- Heat from 350°C to 600°C at 20°C/min
- Cool to 400°C at 20°C/min
- Change the nitrogen gas to air (60 ml/min) and heat from 400°C to 800°C at 20°C/min

## RESULTS AND CONCLUSION

For the investigated rubber material (vulcanized with sulphur) the following results are obtained:

- from 50°C to 350°C under nitrogen, decomposition of plasticizer, oil and wax: 3.5%
- from 350°C to 600°C under nitrogen, decomposition of elastomer: 54.6%
- from 400°C to 800°C under air, combustion of the carbon black: 20.8%
- at 800°C, ash (containing fillers) content: 21.1%

The THEMYS ONE TGA is very well adapted for the investigation of the decomposition of polymeric materials and especially the determination of the compositional analysis of rubber.

For such a test, the THEMYS ONE TGA provides a very flexible heating program for the definition of the different heating and cooling sequences, together with a very efficient and automated gas switching device.

## INSTRUMENT

### THEMYS ONE



**HIGH SENSITIVITY BALANCE FOR THE DETECTION OF SMALL MASS VARIATIONS** specifically designed for TGA analysis.

**CONVENIENCE OF ONE FURNACE** to reach temperatures as high as **1150°C or 1600°C**.

**PLUG AND PLAY INTERCHANGEABLE RODS** to perform TGA only, TG-DSC, TG-DTA, and 3D high sensitivity/Cp measurements.

**EXTERNAL COUPLING CAPABILITY** including evolved gas analysers.