

Generation of a controlled atmosphere

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The French laboratory PIMM uses GasMix™, the gas mixing system by AlyTech. Their main application is to generate an atmosphere with a controlled percentage of oxygen to study organic material ageing.

What is organic material ageing?

The organic material ageing is the study and the prediction of the long-term behavior of polymers and organic materials in their normal use. The Process and Engineering in Mechanics and Materials laboratory (PIMM) is more interested in the analysis and kinetic modeling of oxidation and hydrolysis processes and pays special attention to the connections between microstructures and properties, but also to the effects of coupling between the mechanical loading and the environment (oxygen, water, solvents, radiations ...).

Use of GasMix™



In some industries, especially in aeronautics, the end-of-life of a material is defined by a certain weight loss which shall not be exceeded.

GasMix™ is used in order to recreate an atmosphere with a controlled ratio between oxygen and nitrogen. This is meant to study polymers ageing. One experiment can last several days.

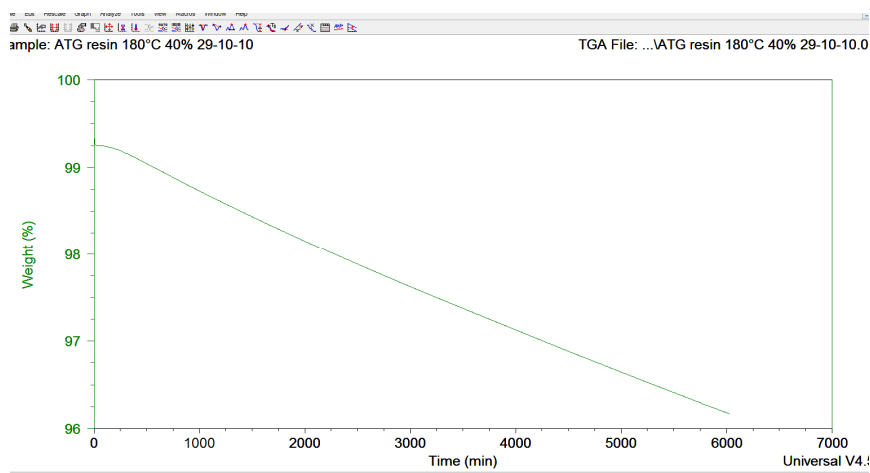
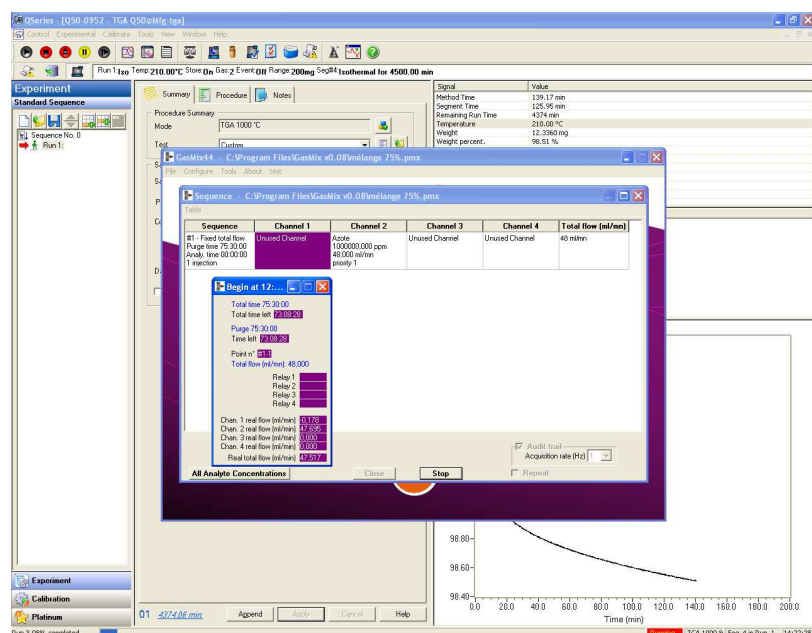
The PIMM's GasMix™ has two mass flow controllers of 50 Scc/min, both calibrated on oxygen and nitrogen. It can prepare gas mixtures with 2.6% to 97.8% oxygen in nitrogen.

The instrument is connected to a thermo gravimetric analyzer (TGA) from TA Instruments.

The thermo gravimetric analyzer records the weight loss of the sample versus time.

GasMix™ is useful in that situation because it allows a wide scale of tests while running automatically for several days.

Below are the results of a resin in a 40% oxygen environment at 180°C. The experiment lasted more than 100 hours without supervision.



TGA coupled to GasMix™ is a precious and efficient tool to monitor weight loss in the study of long-term behavior of materials.

This type of application can be widened to different experimentations where controlled atmospheres are necessary: polymers ageing under UV or humidity content (car industries for example). Other techniques such as DSC (Differential Scanning Calorimetry) and long term oxidative reaction measurements can see their efficiency and interest improved by the control and the automatic evolution of the atmosphere composition.

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