

HIGH PRESSURE CHARACTERISATION OF POLYMERS

EFFECT OF PRESSURE ON THE GLASS TRANSITION TEMPERATURE (T_g) OF AN ELASTOMER SAMPLE BY HP-MicroDSC

When an elastomer is cooled below its glass transition temperature (T_g), it loses its elasticity and becomes brittle. For elastomer O-rings, that are used for sealing purpose, T_g thus corresponds to a lower limit of use. Problems arise when they are used in high pressures systems, as their T_g may be shifted to higher temperatures.

The HP-MicroDSC technique is the most suited to investigate the T_g dependence vs. pressure as it allows purely isobaric temperature scanning experiments.

RESULTS AND CONCLUSIONS

Glass transition temperature (T_g) can be determined at each pressure thanks to the heat capacity change of the elastomer. It is noticed that T_g increases with pressure, with a shift of about 10°C between 1 bar and 400 bar.

As a first approach, the evolution of T_g is described by a linear equation on the tested pressure range with a R2 value of 1. More tests at different pressures

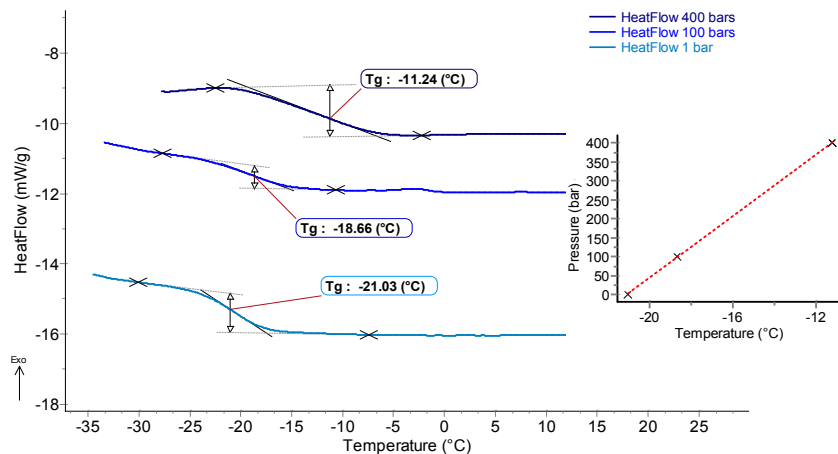
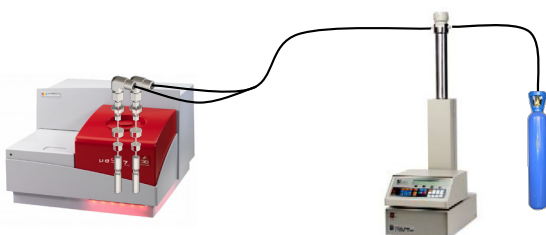


Figure 2: Determination of elastomer glass transition temperature under 1, 100, and 400 bar of nitrogen.

EXPERIMENTAL

Three 360mg samples of the same elastomer O-ring were heated between -40°C and 20°C at a rate of $1\text{K}/\text{min}$ under nitrogen pressures of 1, 100, and 400 bar.



μDSC7 evo
-45°C to 120°C

KEY WORDS
ELASTOMER
TRANSITION VITREUSE
PRESSION