

Rapid Screening Device - RSD™

Technical Application Note 13

DTBP — Pressure Data



Introduction

TAN's 10-12 have detailed aspects of DTBP tested in the RSD and have concentrated on their thermal data. In TAN 13 the thermal data that is obtained is discussed.

In the RSD up to 6 samples can be run simultaneously, all are normally run with a standard pressure line and pressure transducer. The pressure line may be modified to incorporate a T-piece or other device to allow, eg, easy pressure release. The pressure line has a burst disc, near the sample cell, to protect the cell from possible rupture. (This is of use particularly for glass cells). The standard pressure transducers are 60 bar / 900 psi limited though they will withstand a 300% overpressure. The system is set to stop test and cool prior to the pressure limit.

It is appropriate if best quality data is required to run at a slow heating ramp. The data illustrated here is from tests at both 4°C/min and 1°C/min. If analysis is to be done from pressure data it is likely that 'high quality' result is needed and therefore a ramp rate of 1°C/min or below may be used.

NOTE: The RSD software allows test set up to give pressure data in either bar or psi. In this TAN all data is reported in bar.

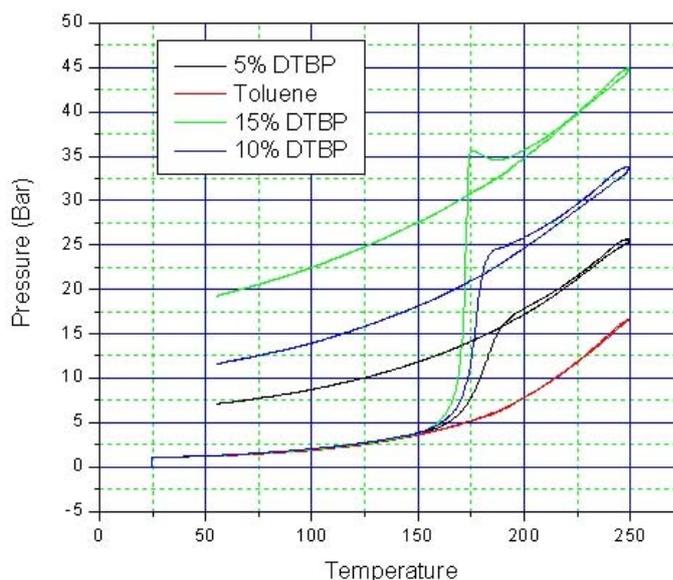
Experimental

All tests described here have been carried out with 6 gm of DTBP in toluene contained in titanium ARC-bombs. With 5%-15% DTBP the heating rate was set at 4°C/min and the system ramped till 200°C or higher. The test with 20% DTBP was run at 1°C/min.

Results

The main graph shown here illustrates 5%, 10% and 20% and pure toluene. The pressure data shows heat up (with pressure rise during decomposition) and cool down showing residual pressure.

On the reverse side is data from 20% DTBP, this is shown plotted against time and temperature. This data has been more fully analysed to show. This test was carried out at a much slower ramp rate and thus lends itself more to full analysis.



Typical result from 20% DTBP

thermal hazard technology

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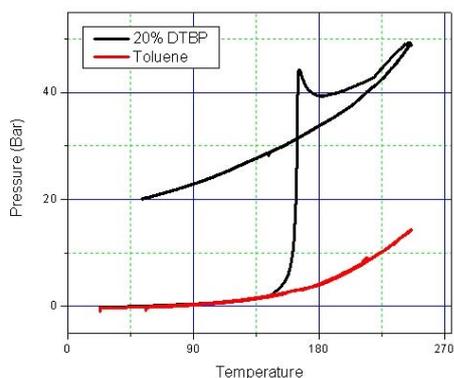
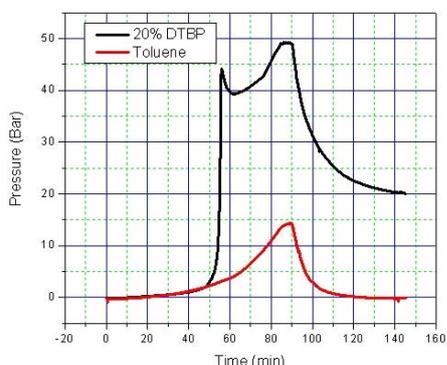
DTBP — Pressure Data



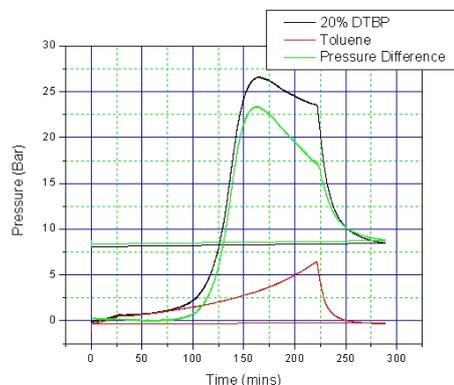
Discussion and Conclusions

The graph shown overleaf shows pressure data obtained under rapid ramp rate—the data is good quality and may be analysed in many ways—the residual pressure may be very important for an understanding of the reaction. Further analysis is not discussed here.

Data from 20% DTBP is shown on this page. Below the pressure data from sample and a pure toluene reference is plotted against time and against temperature. The plot opposite shows also the pressure difference data



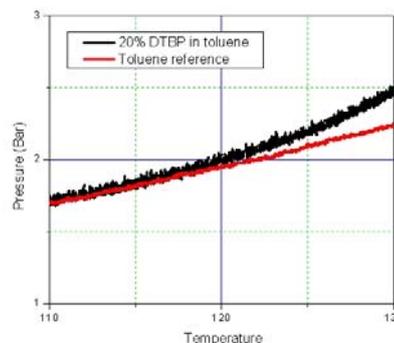
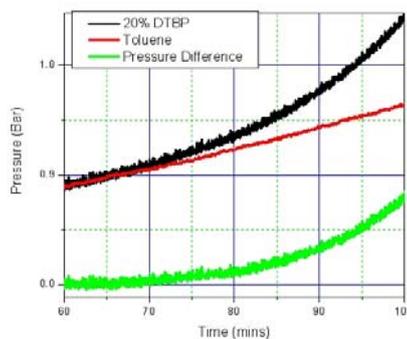
The pressure difference is simply the pressure of the reference subtracted from that measured from the sample—but it gives a clear and very easily visualised graph of the pressure generated from the sample.



Pressure and Pressure Difference Plot

The graphs below indicate the quality of data to be expected from the pressure measurement with the RSD.

It can be seen that at 1°C/min the onset of pressure generation is observed from below 120°C. This is close to the onset seen (from the thermal data) by the Accelerating Rate Calorimeter and is at a temperature below onsets reported from vent sizing calorimeters!



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