Decomposition of DTBP using accelerated rate calorimetry

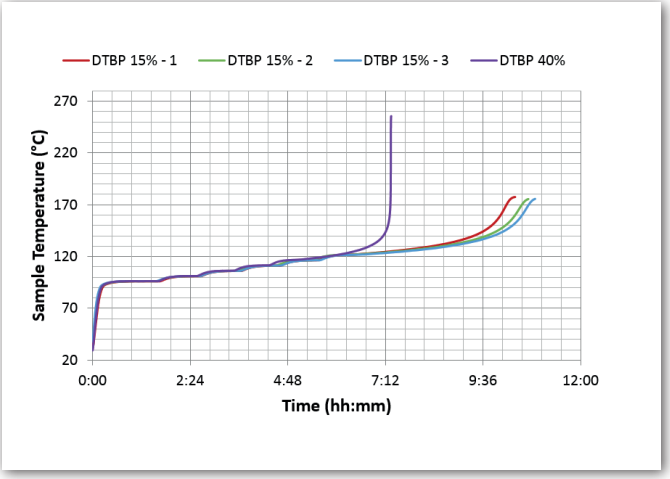
INTRODUCTION

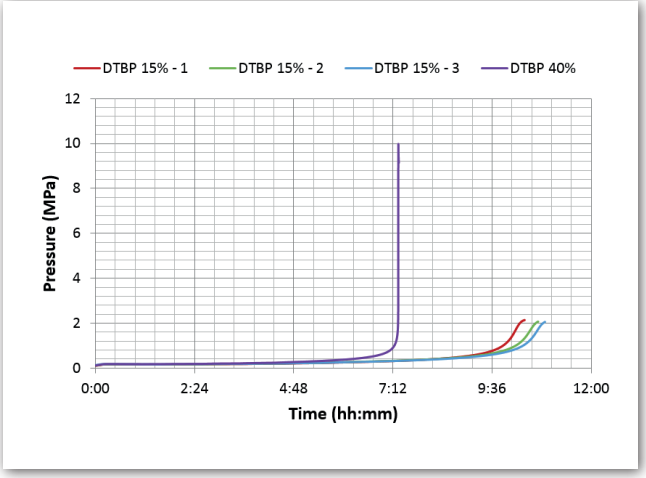
Peroxides, including Di-Ter Butyl Peroxide (DTBP), are typically unstable chemicals that require careful safety studies before being involved in industrial processes.

EXPERIMENT

The following were heated in 8 mL titanium cells using the Heat-Wait-Search mode:
- Three 5 g samples of the same 15 wt% DTBP solution in toluene
- One 5 g sample of a 40 w% DTBP solution in toluene

The Heat-Wait Search parameters were:
- Start temperature: 97 °C
- Temperature steps: 5°C
- Soak Time: 30 min, wait time: 30 min, search time: 15 min
- Detection threshold: 0.02 °C/min
- End Temperature: 250 °C (400 °C with the 40 wt% DTBP solution)





RESULTS AND CONCLUSION

The analysis of experimental data allows for the determination of the onset temperature of decomposition, the adiabatic temperature rise (raw and phi-factor corrected), the temperatures at maximum temperature rise and pressure rise rates, and the pressure increase under adiabatic conditions.

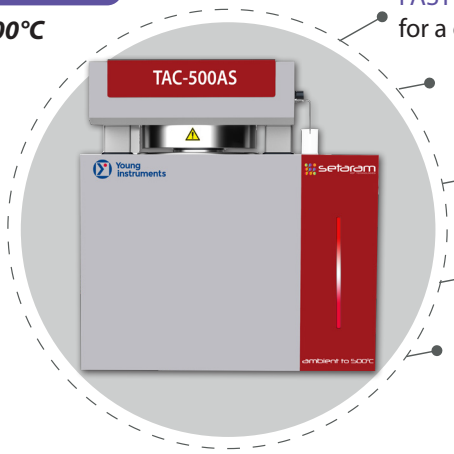
This series of tests has shown the impact of concentration on the temperature and pressure rise of DTBP. A significant increase of concentration leads to drastically higher thermal and pressure risks. Accelerating Rate Calorimetry provides the necessary data to evaluate these risks, and the precision (repeatability) of TAC-500 AS measurements has been proven.

	T_{onset} (°C)	$\Delta T_{ad, raw}$ (°C)	$\Delta T_{ad, corrected}$ (°C)	ΔT at max T rate (°C)	ΔT at max P rate (°C)	ΔT_{ad} (Mpa)
DTBP 15% -1	121.56	56.17	104.50	169.16	164.73	1.90
DTBP 15% -2	121.70	54.46	101.32	166.34	172.07	1.84
DTBP 15% -3	121.64	54.89	101.90	164.30	168.35	1.83
DTBP 40%	116.79	138.71	257.44	210.55	187.46	9.70

INSTRUMENT

TAC 500 AS

Ambient to 500°C



FAST TRACK RATE
for a good measurement accuracy even at lower phi factors

LOW ONSET TEMPERATURE
detection threshold

PRACTICAL BENCH TOP INSTRUMENT
with a compact design for lab space saving and easier maintenance

CONVENIENT TO USE
with good usage to maintenance time ratio

ACCESSIBLY PRICED
instrument and replacement parts