

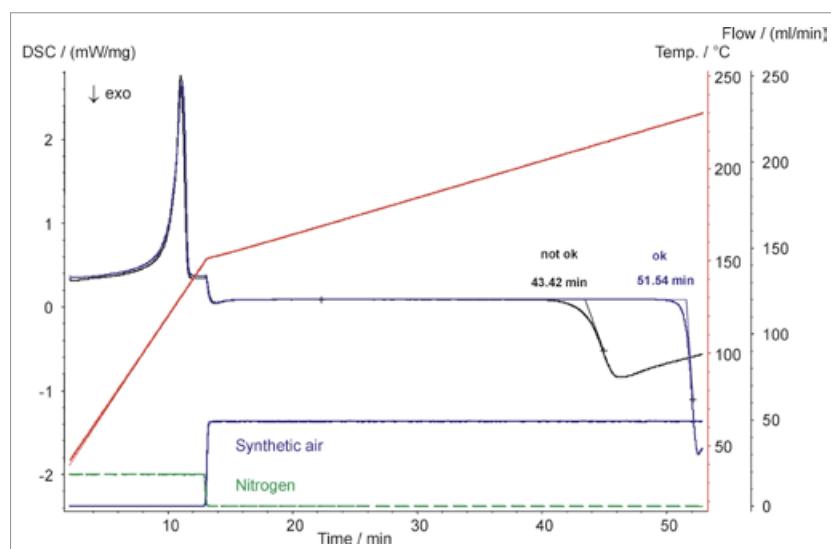
# APPLICATION SHEET

POLYMERS – POLYMER MANUFACTURING

## OXIDATION STABILITY OF POLYETHYLENE

Polyethylene is a thermoplastic commodity heavily used in consumer products (over 60M tons are produced worldwide every year). Polyethylene is created through polymerization of ethene. It can be produced through radical polymerization, anionic polymerization, ion coordination polymerization or cationic polymerization. This is because

ethene does not have any substituent groups which influence the stability of the propagation head of the polymer. Each of these methods results in a different type of polyethylene. All polymers age during usage and storage. By means of DSC, the ageing behavior of polymers can be studied.



### Instrument

DSC 204 **F1** Phoenix®

### Test Conditions

Temperature range	RT ... 230°C
Heating/cooling rates	10 K/min, 2 K/min
Atmosphere to 150°C	Nitrogen (30 ml/min)
Sample mass	3.25 ± 0.1 mg
Crucible	Aluminum, open
Atmosphere to 230°C	Air (50 ml/min)

### Results

The oxidation behavior of two PE tubes was compared. The samples were heated above the melting temperature at 10 K/min in inert gas (nitrogen). At 150°C, the purge gas (dashed lines) was changed to synthetic air (N<sub>2</sub>:O<sub>2</sub> = 80:20). The effectiveness of stabilizing additives extends the time the sample resists against oxygen, whereas aging usually reduces the resistance of polymers against oxidation. The oxidation reaction for sample 1 (blue line) started after 51.5 min and already after 43.4 min for sample 2 (black line). Therefore, the oxidation resistance for sample 1 is obviously much better.