

# **Evaluation of antioxidant activity in polyolefin based materials after accelerated aging**

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## **Abstract**

Information on the efficiency of antioxidants in protecting polymers against thermal oxidation under service conditions is essential for selection and development of appropriate stabilizing systems. Accelerated ageing tests are necessary to obtain results in an acceptable time and need carefully selected failure criteria. Especially for reliable lifetime assessments based on accelerated aging tests, e.g. oven test in air or autoclave test under elevated oxygen pressure, and simultaneous monitoring of specific material properties (e.g. tensile strength) the determination of effective stabilizer contents is an essential additional instrument for relevant investigations and development of testing methods.

One well established method for the assessment of antioxidant efficiency is the determination of the oxidation induction time (OIT) using differential scanning calorimetry (DSC). Standard-OIT is usually performed at rather high temperatures in the polymer melt. These conditions - often near to thermal conditions during melt processing – may fail to reliably determine the effective activity of some antioxidant systems, especially long-term stabilizers based on hindered amines. Although the usefulness of these OIT values as sole basis of lifetime assessments might be questionable, this method is common for quality control and in-house testing of manufacturers and users of polyolefin materials.

We present a systematic comparison of results from OIT measurements using standard and high-pressure DSC with those from ICOT (Initiated Cumene Oxidation Test) and tensile testing obtained for a series of well defined polymer samples with known content of different antioxidant stabilizers using different accelerated aging methods.