Format

Messtechnik GmbH

# Pot Life and Curing Monitoring of CASE-Formulations at High Temperatures

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## SubCASE® HT

**Pot Life and Curing Monitor for reactive**

- **C**oatings
- **A**dhesives
- **S**ealants
- **E**lastomers

**based on:**

- **PU formulations**
- **EP, UP, and MMA resins**


***Fig. 1:*** Test device **SubCASE HT** for measuring the pot life and the curing of Coatings, Adhesives, Sealants and Elastomers (C.A.S.E.). The reaction profile is determined by dielectric polarization and temperature measurement.

Standard laboratory methods for testing the reaction profile of **C**oatings, **A**dhesives, **S**ealants and **E**lastomers (C.A.S.E.) are mainly based on mechanical and thermal measurements. *Format* Messtechnik GmbH has introduced the device SubCASE® for measuring the dielectric properties during chemical reactions at low and intermediate temperatures. Based on this, the new test device SubCASE® HT (Fig. 1) has been developed, making significant improvements in the measurement of the pot life and the curing of CASE formulations. SubCASE® HT is specially designed for testing polyurethane formulations (PU) (Fig. 2), epoxy resins (EP) (Fig. 3), unsaturated polyester resins (UP), and methyl methacrylate resins (MMA) (Fig. 4) at **high temperatures**.

SubCASE® HT combines dielectric polarization measurement and temperature measurement in one compact laboratory device. The dielectric polarization reveals the electro-chemical process during compound formation and cross-linking. Conclusions can be drawn from this regarding the pot life and the curing behavior of the material. The heated CMD-sensor (**C**uring **M**onitor **D**evice), introduced by *Format* Messtechnik GmbH measures the dielectric features of the reactive components by applying an alternating voltage of different frequencies. The heat release by the polymerization reaction is recorded as the core temperature by a thermocouple positioned in the center of the sample. Another temperature sensor is integrated into the CMD-sensor in order to measure the contact temperature of the sample and for controlling the heating power. Starting temperatures as high as 150°C can be provided by the device. Production near testing conditions can be achieved by heating the CMD-sensor to any reaction relevant temperature.

The reactive test material is poured into a cardboard cylinder; the heated CMD-sensor is located at the bottom of this cylinder. The test set-up (Fig. 5) is covered by an insulation hood with a bushing for the thermocouple. The software SUBCASE continually records the measurement data and displays them in an online graph. After the test has been completed, the results are shown in a parameter list as well as in diagrams. The pot life is defined as a certain value of the polarization curve. The software SUBCASE calculates the curing from the dielectric polarization gradient. Due to a protection foil on the CMD-sensor the cured sample can be removed easily from the device. SubCASE® HT can be used in quality assurance as well as in production control applications.

*patents 10252211 and 102004001725*

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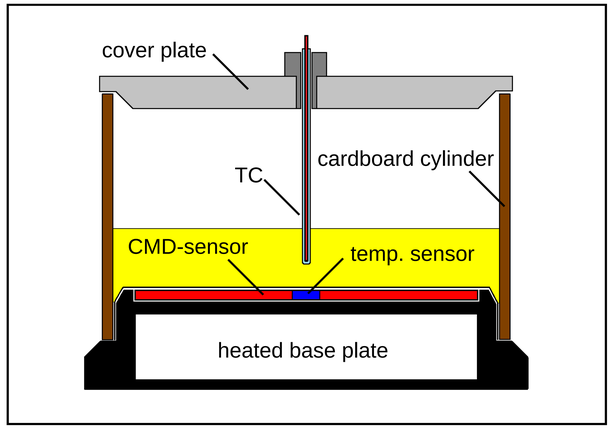


***Fig. 5:*** Cross section of the SubCASE HT test container. The CMD-sensor is mounted onto the temperature controlled base plate. The core temperature is measured with a thermocouple.

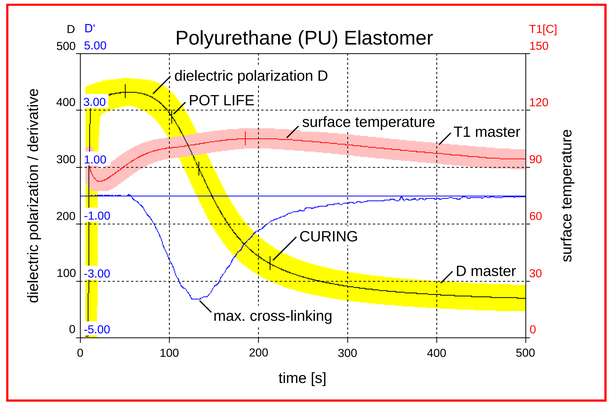


***Fig. 2:*** Measurement curves of the dielectric polarization D and the surface temperature T1 of a polyurethane elastomer. The D master and the T1 master are margins for QC purpose; they are provided by the software SUBCASE.

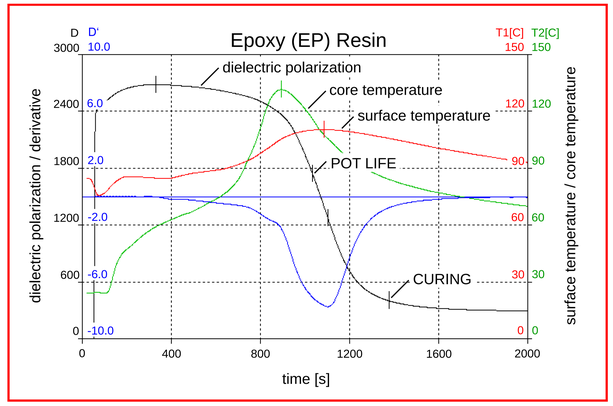


***Fig. 3:*** Measurement curves of the dielectric polarization D, the surface temperature T1, and the core temperature T2 of an epoxy (EP) resin. The core temperature is measured by the thermocouple (TC) in the center of the test sample.

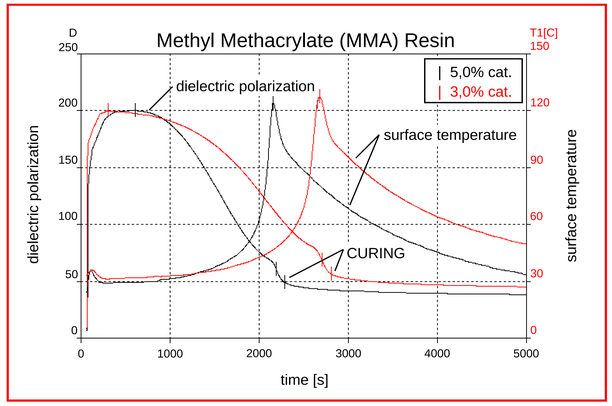


***Fig. 4:*** Comparison of two methyl methacrylate (MMA) resins with different amount of catalyst. The different curing behavior is shown in the dielectric polarization curve D, as well as in the surface temperature curve T1.