Masterproef industriële ingenieurswetenschappen

Optimization of the precision and accuracy of methods for the determination of chloroprene rubber (CR) in complex elastomer blends and technical elastomeric materials

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Abstract

The Instrumental Analysis and Polymer Characterization group (IAPC) in Merseburg is specialized in the characterization of physical and chemical properties of polymers. Technical elastomers are characterized by the polymer composition and the additives used. For chloroprene rubber (CR), it is difficult to determine quantitatively the polymer-related CR content by pyrolysis GC/MS due to its inaccurate and time-consuming nature. The goal of this thesis is to combine the Schöniger digestion (SD) with Thermo gravimetric analysis (TGA) in order to determine the CR content in an elastomeric mixture.
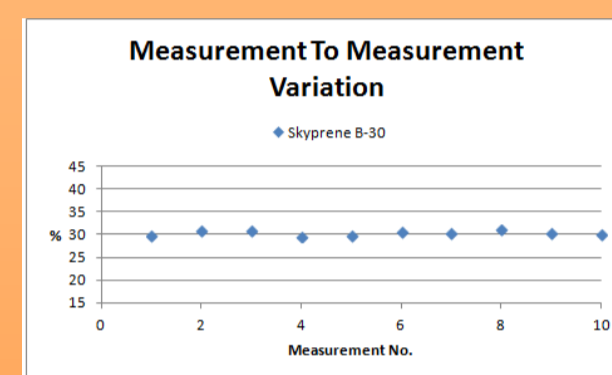
Chloroprene rubber (CR)
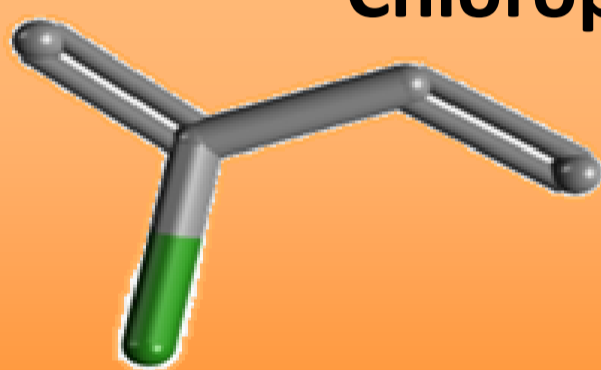
✓ Good abrasion resistance
✓ Excellent physical properties
✓ Resistance to water and organics
✓ Processing possibilities
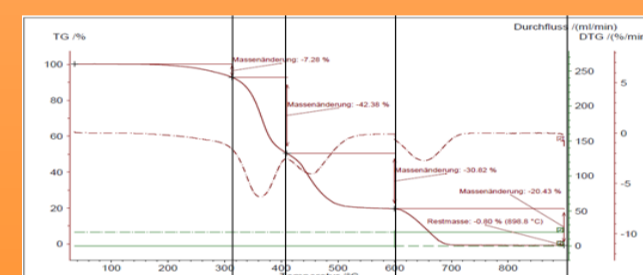
How to determine CR in any elastomeric material?

Materials & Methods

Chloride determination

… with …

Schöniger digestion

%

Rubber determination

… with …

TGA

%

CR %

Results & Discussion

• *Optimization of Schöniger digestion*

✓ Stable output

✓ High yield of chloride

✓ Acceleration of 240 %

Measurement To Measurement Variation

• *TGA execution*

✓ Boundaries determined

✓ Decay simulated

✓ Recovery calculated on ternary elastomeric mixtures

✓ CR determination using pyrolytic carbon black decay
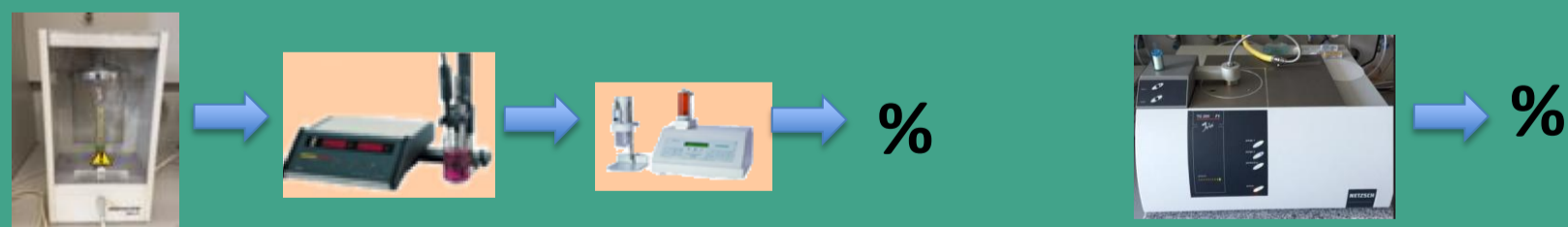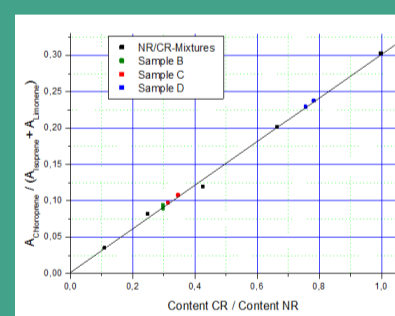
Comparison with Pyrolysis GC/MS

Comparison of the CR determination on the ternary elastomeric mixtures with the combined method and Pyrolysis GC/MS

Sample m% (NR/SBR/CR)	CR content (SD + TGA) %	CR content (Pyrolysis GC/MS) %
C (60/20/20)	19.6	18.4
D (40/20/40)	40.6	35.0

Conclusions & Outlook

✓ Successful Optimization of SD

✓ Mathematical correlation found ➜ Further research

✓ Determination of polymer related CR with good precision

✓ Accurate & stable results in comparison with Pyrolysis GC/MS

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