Downloaded from UvA-DARE, the institutional repository of the University of Amsterdam (UvA)
http://dare.uva.nl/document/122447

File ID	122447
Filename	Contents
Version	Final published version (publisher's pdf)

SOURCE (OR PART OF THE FOLLOWING SOURCE):

Type	Dissertation
Title	Characterisation of polymeric network structures
Author	R.A.H. Peters
Faculty	Faculty of Science
Year	2009
Pages	214
ISBN	9789052787831

FULL BIBLIOGRAPHIC DETAILS:
http://dare.uva.nl/record/292197

Copyright

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use.

UvA-DARE is a service provided by the library of the University of Amsterdam (http://dare.uva.nl)

Content

1. Introduction to polymeric networks and their analysis

1.1. Introduction to polymers 2
1.2. Polymeric networks 4
1.2.1. Chemically *vs.* physically cross-linked networks 4
1.2.2. Types of chemically cross-linked networks 4
1.2.3. Network imperfections 8
1.3. Analysis of polymeric networks 10
1.3.1. Direct approach 11
1.3.1.1. Physical/mechanical measurements 11
1.3.1.2. Spectroscopic approaches 13
1.3.1.3. Analysis of the starting materials 16
1.3.2. Indirect approach 17
1.3.2.1. Pyrolysis 18
1.3.2.2. Chemical degradation 20
1.3.2.3. Model compounds 22
1.4. Scope of the thesis 22

2. Characterisation of UV-cured acrylate networks by means of hydrolysis followed by aqueous size-exclusion combined with reversed-phase chromatography

2.1. Introduction 32
2.2. Experimental 36
2.3. Results and discussion 39
2.3.1. Analytical results 39
2.3.1.1. Analysis of the purity of the starting materials 39
2.3.1.2. Determination of *kcl* and XL_c by SEC–LC 41
2.3.1.3. Analysis of extractables 46
2.3.2. Chemical network structure 47
2.3.3. Network parameters 51
2.3.4. Comparison of cross-link densities with s-NMR and DMA data 53
2.4. Conclusion 56

3. Integrated approach to characterise the styrene/di-methacrylate network structure
Influence of styrene and radical-transfer agent

3.1. Introduction 60
3.2. Experimental 64

3.3. Results and discussion 66
3.3.1. Characterisation of the starting materials by LC-UV-MS and MALDI-TOF-MS 66
3.3.2. Curing of the network 69
3.3.3. Glass transition and degradation temperature of network 72
3.3.4. Analysis of the polymeric backbone 73
3.4. Chemical network structure 80
3.5. Conclusion 85

4. Hydrolytic degradation of poly(D,L-lactide-co-glycolide 50/50)-di-acrylate network as studied by liquid chromatography–mass spectrometry

4.1. Introduction 90
4.2. Experimental 93
4.3. Results 96
4.3.1. Chemical composition of poly-(*D,L*-lactide-*co*-glycolide 50/50)-di-acrylate 96
4.3.2. Weight loss and pH change during the degradation 97
4.3.3. Liquid chromatography – mass spectrometry analysis of the sol fraction 97
4.3.3.1 Analysis of oligomers and residual photo-initiator released 98
4.3.3.2 Analysis of polyacrylate chains released 103
4.4. Discussion 107
4.5. Conclusion 111

5. Low-molecular-weight model study of peroxide cross-linking of EP(D)M rubber using gas chromatography- mass spectrometry Combination reactions of alkanes

5.1. Introduction 116
5.2. Experimental 120
5.3. Results 122
5.3.1. Qualitative analysis of alkane/peroxide reaction products 122
5.3.1.1. Identification of DCP decomposition products 122
5.3.1.2. Identification of alkane reaction products by GC–MS and GC×GC–MS 123
5.3.1.3. Identification of alkane reaction products by QSPR 129

5.3.2. Quantitative analysis of alkane reaction products by GC-FID 134
5.4. Conclusion 136

6. Low-molecular-weight model study of peroxide cross-linking of EPDM rubber using gas chromatography- mass spectrometry Addition and combination

6.1. Introduction 142
6.2. Experimental 145
6.3. Results 147
6.3.1. Qualitative analysis of alkane/alkene/DCP reaction products 147
6.3.2. Quantitative analysis of alkane/alkene/DCP reaction products 155
6.3.3. Cross-linking mechanism of EPDM 159
6.4. Conclusion 161

7. Characterisation of UV-cured acrylate networks as studied by thermal degradation methods

7.1. Introduction 164
7.2. Experimental 169
7.3. Results 174
7.3.1. DSC and TGA of cross-linked acrylates 174
7.3.2. Pyrolysis-MS of cross-linked acrylates 176
7.3.3. MALDI-TOF-MS of cross-linked acrylates 183
7.3.4. Pyr-LC-MS of cross-linked acrylates 187
7.3.4.1. Off-line Pyr-LC-MS 187
7.3.4.2. On-line Pyr-LC-MS 190
7.4. Discussion and conclusion 194

Summary 203

Samenvatting 207

Dankwoord 211

Bibliography 213