

Chitosan Oligomer as a Raw Material for Obtaining Polyurethane Foams

Anna Strzałka ¹, Renata Lubczak ² and Jacek Lubczak ^{2,*}

¹ Doctoral School of Engineering and Technical Sciences, Rzeszow University of Technology, Al. Powstancow Warszawy 6, 35-959 Rzeszow, Poland

² Faculty of Chemistry, Rzeszow University of Technology, Al. Powstancow Warszawy 6, 35-959 Rzeszow, Poland

* Correspondence: jml@prz.edu.pl

Table S1. Interpretation of MALDI-TOF spectrum of polyol (CS+GL)+EC.

Entry	Signal position m/z	Relative intensity of signal [%]	Molecular ion structure	Calc. molecular weight [g/mol]
1	96.919	100.00	GL+Na ⁺	97.027
2	101.035	8.26	GL+OE-H ₂ O+H ⁺	101.060
3	112.950	40.31	GL+K ⁺	113.000
4	114.858	34.78	GLYC+Na ⁺	115.037
5	120.936	14.86	GL+OE+H ⁺	119.071
6	140.918	11.29	GL+OE+Na ⁺	141.053
7	156.923	31.38	GL+OE+K ⁺	157.027
8	197.006	78.74	GLYC+GL+CH ₃ OH	198.110
9	212.810	6.84	GLYC+GL+OE+H ⁺	211.118
10	236.938	5.69	GLYC+3OE-H ₂ O+ CH ₃ OH	238.142
11	263.080	6.38	GLYC+2GL+Na ⁺	263.111
12	293.085	97.34	GLYC+GL+2OE+K ⁺	293.100
13	307.099	35.42	GLYC+2GL+OE+Na ⁺	307.137
14	321.115	17.96	4GL+EO-H ₂ O	322.163
15	351.158	22.93	GLYC+2GL+2OE+H ⁺	351.163
16	365.134	24.00	4GL+2OE+H ₂ O	366.189
17	393.937	89.83	2GL+6OE-H ₂ O	394.220

Description of abbreviations used in the table:

GL – glycidol, GLYC - glycerol OE – oxyethylene group from EC, H₂O – water, K⁺ – potassium ion from the catalyst K₂CO₃, Na⁺ – sodium ion, CH₃OH – methanol

Table S2. Interpretation of MALDI-TOF spectrum of polyol (CS+GL+EC).

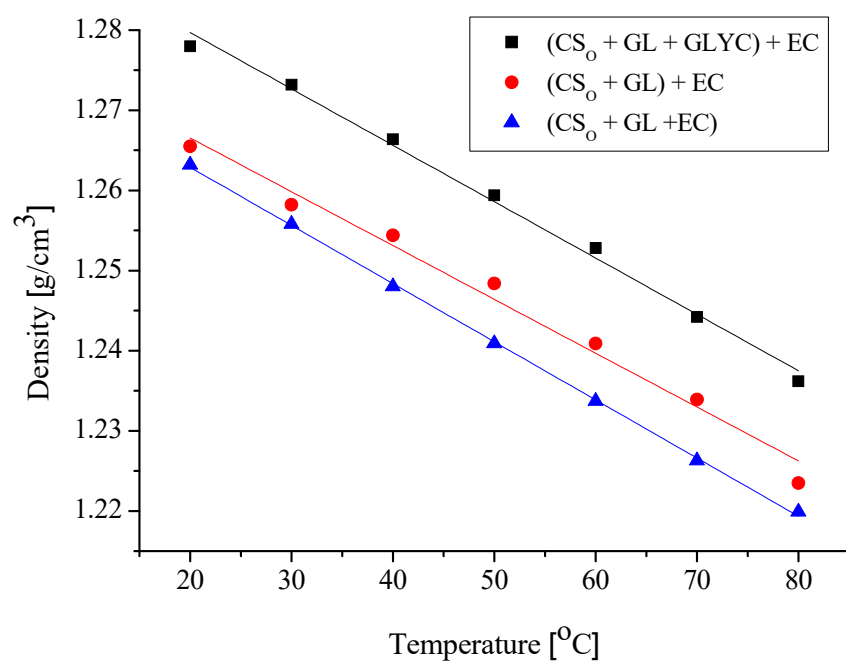
Entry	Signal position m/z	Relative intensity of signal [%]	Molecular ion structure	Calc. molecular weight [g/mol]
1	96.942	18.71	GL+Na ⁺	97.027
2	101.085	19.86	GL+OE-H ₂ O+H ⁺	101.060
3	112.861	29.61	GL+K ⁺	113.000
4	114.858	27.80	GLYC+Na ⁺	115.037
5	156.860	17.39	GL+OE+ K ⁺	157.027
6	263.100	5.17	GLYC+2GL+ Na ⁺	263.111
7	291.186	100.00	GLYC+GL+2OE+K ⁺	293.100
8	307.160	39.28	GLYC+2GL+OE+Na ⁺	307.137
9	337.125	23.62	3GL+3EO- H ₂ O+ H ⁺	337,186
10	351.139	80.22	GLYC+2GL+2OE+Na ⁺	351.163
11	365.170	25.95	4GL+2OE+H ₂ O	366.189
12	381.147	31.53	3GL+4EO- H ₂ O+ H ⁺	381,213
13	393.950	81.77	2GL+6OE-H ₂ O	394.220

Description of abbreviations used in the table:

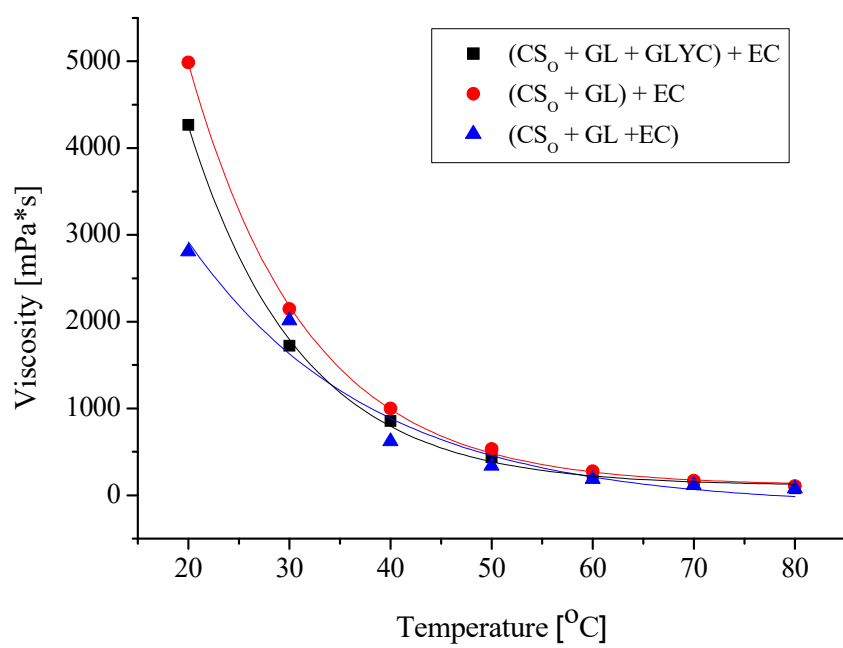
GL – glycidol, GLYC - glycerol OE – oxyethylene group from EC, H₂O – water, K⁺ – potassium ion from the catalyst K₂CO₃, Na⁺ – sodium ion, CH₃OH – methanol

Table S3. Thermal analysis of foam determined by the dynamic method.

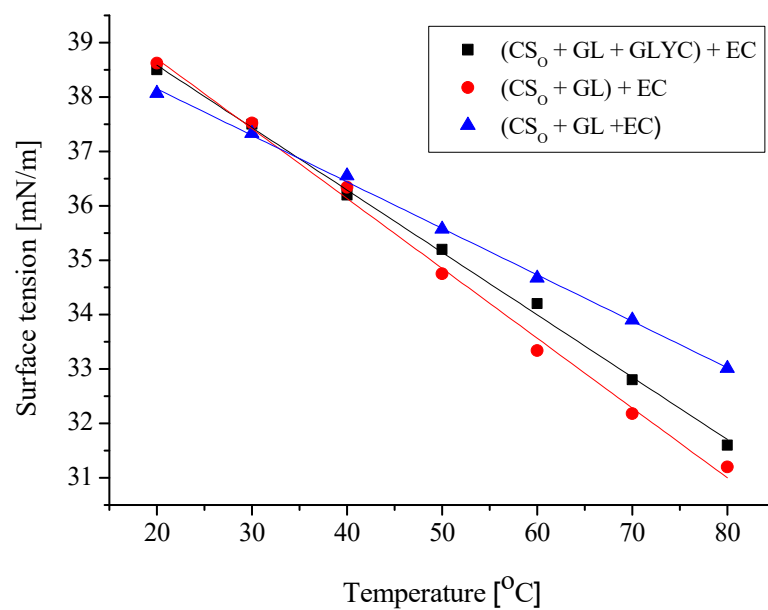
Foam obtained from	Water [%]	T _{5%} [°C]	T _{10%} [°C]	T _{25%} [°C]	T _{50%} [°C]	T _g [°C]
(CS ₀ +GLYC+GL)+EC	2	221	261	311	382	72
	3	247	266	317	385	73
(CS ₀ +GL)+EC	2	75	156	186	226	104
	3	75	172	208	284	113
(CS ₀ +GL+EC)	2	186	222	280	350	100
	3	87	203	263	328	100



(a)



(b)



(c)

Figure S1. Changes of density (a), viscosity (b), and surface tension (c) of polyol as a function of temperature.

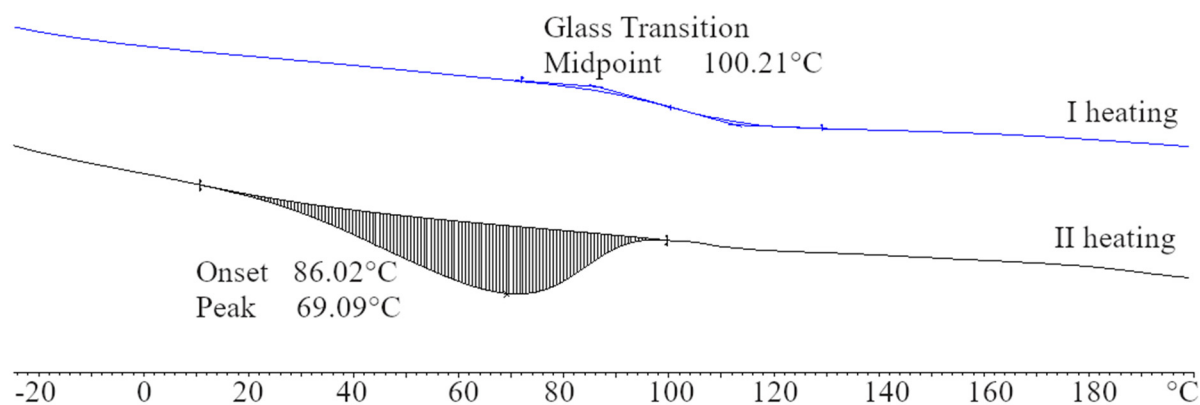


Figure S2. Thermogram of foam obtained from polyol (CS+GL+EC) (2% H₂O/100 g of polyol).