Elastomer Applications

Make high performing polyurethanes from polyols based on CO2

Elastomers represent a $5.0bn global market cutting across a broad range of applications. This important group of polyurethanes has traditionally relied on fossil-based feedstocks, and developing sustainable alternatives has been a challenge —most innovations have failed to meet performance criteria.

Econic is pleased to introduce a solution. Our PCE polyols, made using CO_2 as a co-monomer, can produce sustainable elastomers with a significantly reduced carbon footprint. Polyols typically make up more than 60% of a polymer elastomer formulation, so reducing the carbon footprint of the polyol has a significant impact on an elastomer's environmental profile.

Elastomers made with PCE polyols perform as well as standard polyols including polyether (polypropylene glycols or PPG), polytetramethylene ether glycol (PTMEG), polyester, polycaprolactone (PCL) and polycarbonate (PC).

KEY BENEFITS

- Contain up 16.5% CO_2 by mass
- Same polymerisation conditions as competing materials
- Improved strength and abrasion resistance
- Better resistance to hydrolysis and oil swell

EXAMPLE FORMULATION

Polyol	61
MDI	31
1,4-Butanediol	8
Trimethylolpropane	0.4
Mixed carboxylate catalyst	165 ppm

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Polyol Data

	PCE #1	PCE #2	PCE #3	PPG	PTMEG	Polyester	PCL	PC
Molecular Weight (g/mol)	2000	2000	2000	2000	2000	2000	2000	2000
CO_2 content (wt%)	12	19	27	0	0	0	0	0

Elastomer Performance Data

	PCE #1	PCE #2	PCE #3	PPG	PTMEG	Polyester	PCL	PC
Oil swell[1]	10.5	7.0	1.9	21.5	31.4	3.5	7.8	6.2
Hydrolysis resistance[2]	2.4	2.1	1.8	1.9	2.5	2.1	1.7	-
Abrasion resistance[3]	0.55	0.48	0.96	0.48	0.38	0.76	0.05	-
Tensile modulus[4] (MPa)	7.8	8.7	17.9	6.9	8.1	8.3	6.5	10.3
Elongation at break (%)	480	430	350	380	370	420	-	310
Tear resistance (N/mm)	60	67	122	30	67	75	-	72
Tg (°C)	-8.0	13.0	30.0	-22.0	-33.0	-9.0	-14.0	4.0
Hardness - Full Shore A	89	92	99	85	92	90	88	93
Hardness - Full Shore D	21	24	50	13	24	22	24	27

[1] % mass change after 60 days
[2] % mass change after 7 days
[3] % mass loss
[4] @ 100% elongation

> Sustainable chemistry shouldn't mean trade-offs. PCE polyols demonstrate that incorporating CO_2 into elastomer formulations can enhance material performance while addressing the carbon intensity of polyurethane systems.

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