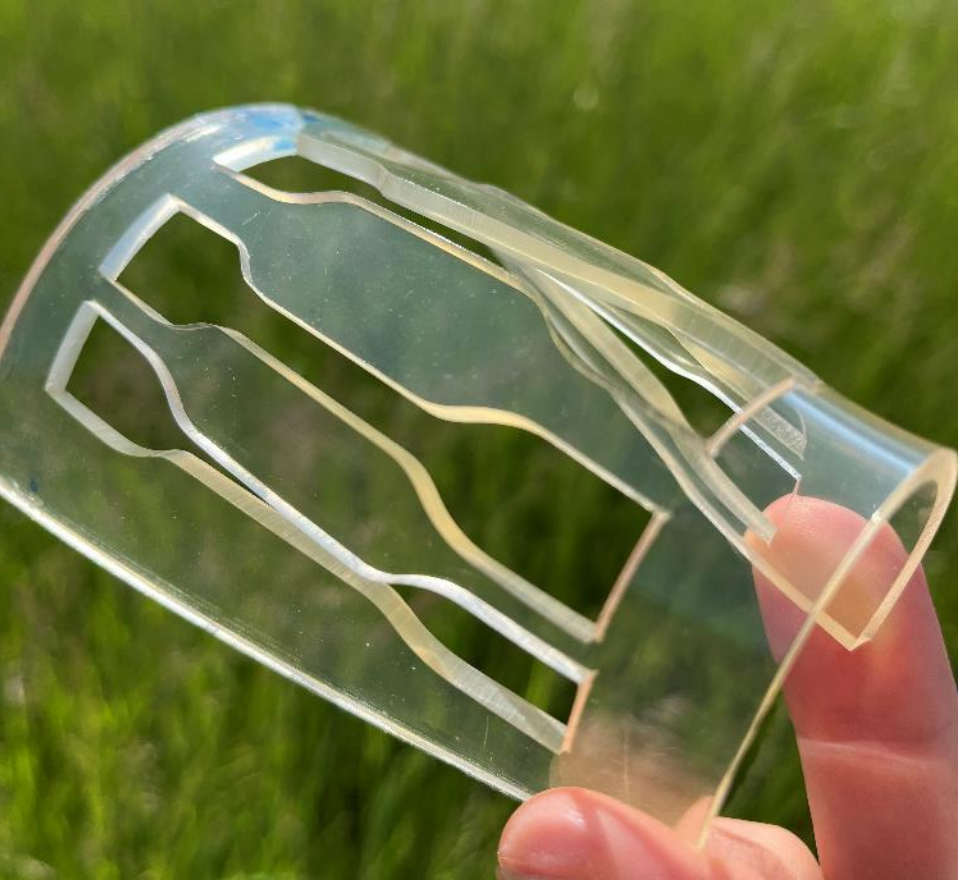


Biobased Polymeric Flexibilizers

Bioplastics Business Breakfast K'2022

Dr. Christian Müller – Green Polymer Additives – Emery Oleochemicals

Emery Oleochemicals at a Glance

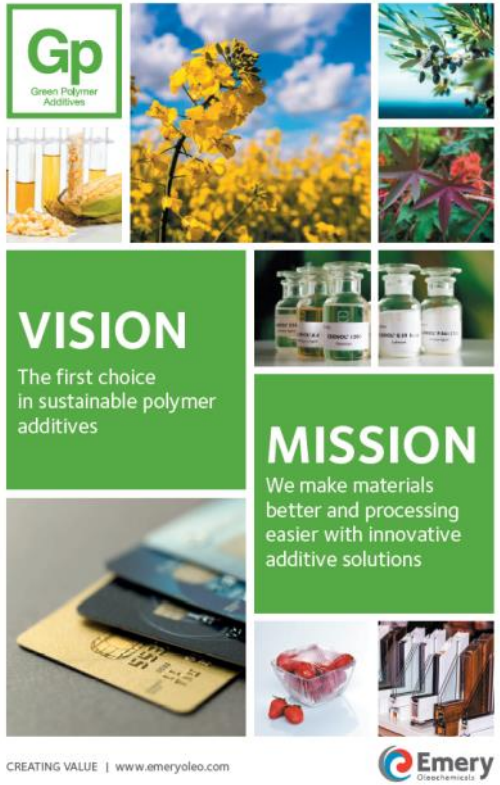
5 Business Units Focussed on Biobased Chemistry

LOXIOL®
- Lubricants
- Release Agents
- Surface Finish Agents

EDENOL®
- Special Plasticizers / Flexibilizers

EMEROX®
- Azelaic Acids

→ Founded as an oleochemical company in 1840
→ Expertise in process and performance additives for plastics since 1957
→ Predominantly biobased products
→ Technical Development Centers in Germany, Japan and USA



Biobased Polymeric Flexibilizers

Why Flexibilizers (Plasticizers)?

- ✓ They allow polymer chains to glide along each other, so make plastics softer and/or more flexible
- ✓ For optimal functionality they need to be highly compatible with the polymer

Why Polymeric?

- ✓ Polymerics provide a (much) higher molecular weight compared with monomerics
- ✓ Weight and so size of their molecules result in improved resistance to undesired migration or exudation
- ✓ Compatibility can be tailored by proper choice of monomers

Why Biobased?

- ✓ Reduction of fossil-based carbon as quickly and as much as possible
- ✓ Flexibilizers make up a considerable share of the carbon content of flexibilized plastic compound formulations
- ✓ By using an ideally 100 % biobased flexibilizer, the biobased share of the plastics material can be increased significantly

Product Innovation

EDENOL® 2178

EDENOL® 2192

Biobased Polymeric Flexibilizers

What both products have in common

- ✓ 100 % biobased carbon content
- ✓ Readily biodegradable
- ✓ All monomers comply with indirect food contact regulations
- ✓ Suitable as plasticizer for PVC and flexibilizer for bioplastics
- ✓ Non-hazardous substances
- ✓ Available from 1 kg sample to full truck load today
- ✓ Made in Germany

What both products differ in

- ✓ Molecular weight and, as a consequence, viscosity:
  - EDENOL® 2178 → approx. 700 mPas at 20 °C
  - EDENOL® 2192 → approx. 5000 mPas at 20 °C

Technical comparison in PLA

Comparison of PLA using 10 % of EDENOL® 2178 or EDENOL® 2192 to:

- Glycerin – typical PLA flexibilizer
- Triacetin – tri acetic acid ester of glycerin
- ESBO – Epoxidized soy bean oil
- ATBC – Acetyl tributyl citrate
- PBAT – Polymer often blended with PLA

For more details please see:
issue 02/2021
(bioplasticsmagazine.com)

Flexibilizer	Biobased Carbon Content	Compoundable in PLA	Flexibilizing Properties
EDENOL® 2178	**100 %**	✓	**+**
EDENOL® 2192	**100 %**	✓	**+**
Glycerin	100 %	×	-
Triacetin	33 % *	✓	+
ESBO	100 %	✓	0
ATBC	30 % *	✓	+
PBAT	< 50 % *	✓	+

* with precursors acetic acid, butanol, adipic acid and/or terephthalic acid to be non-biobased

Applications

Polymers

- ✓ PLA & Blends e.g. with PHA‘s
- ✓ PLA/PBAT blends to reduce the share of PBAT
- ✓ PLA containing high load of natural fillers
- ✓ TPS
- ✓ PVC

Products

- ✓ Films
- ✓ Sheets
- ✓ Injection molded parts
- ✓ Extruded parts
- ✓ 3D printing filaments

Benefits

- ✓ Easier processing
- ✓ Better material performance

What does it mean?

Market Reactions on Benefits

[…] excellent compatibilizer between polymer and filler […]

[…] multiple uses for the compounds thanks to high elongation at break and improved impact resistance […]

[…] high flowability in the process […]

Customers about EDENOL® 2178 and EDENOL® 2192

[…] well compatible to polymer even up to 20 % dosage […]

[…] odor free […]

Conclusion & Take Away Message

My Notes on „Biobased Polymeric Flexibilizers“

- EDENOL® 2178 and 2192: 100 % biobased flexibilizers for bioplastics
- Well-tested, multiple benefits found
- Available NOW from THE long-time experts in biobased polymer additives

Action: Need to evaluate. Order sample.

THANK YOU FOR YOUR ATTENTION

Dr. Christian Müller

Global Head of Business Development & Marketing
Green Polymer Additives
Emery Oleochemicals

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