Pipe customer event – Regulatory challenges for pipe resins and applications

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Agenda

- The paradigm shift: From safe use of chemicals towards use of safe chemicals
- LyondellBasell activities in the field of pipe applications
- Example for NIAS: Arvin components and how LYB deals with them

1 The paradigm shift: From safe use of chemicals towards use of safe chemicals

Regulatory trends following change in public perception

Paradigm shift from safe use of chemicals towards the use of safe chemicals

- Plastics usage and suitability under stricter observation
- Regulation at various levels make it very complex
- European Commission: EU Green Deal – EU Chemicals Strategy for Sustainability is potentially affecting over 40 individual regulations – directives
- Member states taking action on top of European Commission
- EU Parliament active as well: ex. Ecodesign Sustainable Product Regulation

From safe use of chemicals towards use of safe chemicals (I)

Hazard profile sole reason for banning substances

- Risk, exposure no longer considered
- Drive for more data or information at chemicals level
- Lifting of exemption for substances such as polymerization aid
- Low requirements for some substances raise concerns about the suitability of existing testing methods in specific cases

Precautionary regulatory action

- Examples
- Restriction of microplastics

Introduction of new concepts

- Substances of concern - Substances of emerging concern
- Essential use
- Mixture assessment factor

From safe use of chemicals towards use of safe chemicals (II)

REACH no longer sole regulation for chemicals

- Eco-design for sustainable products regulation
- Positive list of substances to be used in the recipes of plastics materials (DWD)

One substance – One assessment

- Current difficulties to access information across EU regulatory bodies

Value chain considerations

- Risk based approach (DWD) along the complete supply chain
- Life cycle analysis (LCA)
- Transparency for consumers

2 LYB activities in the field of pipe applications

LYB activities in the field of pipe applications

Advocacy on key regulatory topics
Collaboration with Plastic Europe, TEPPFA, KRV on the recast of the Drinking Water Directive (DWD)

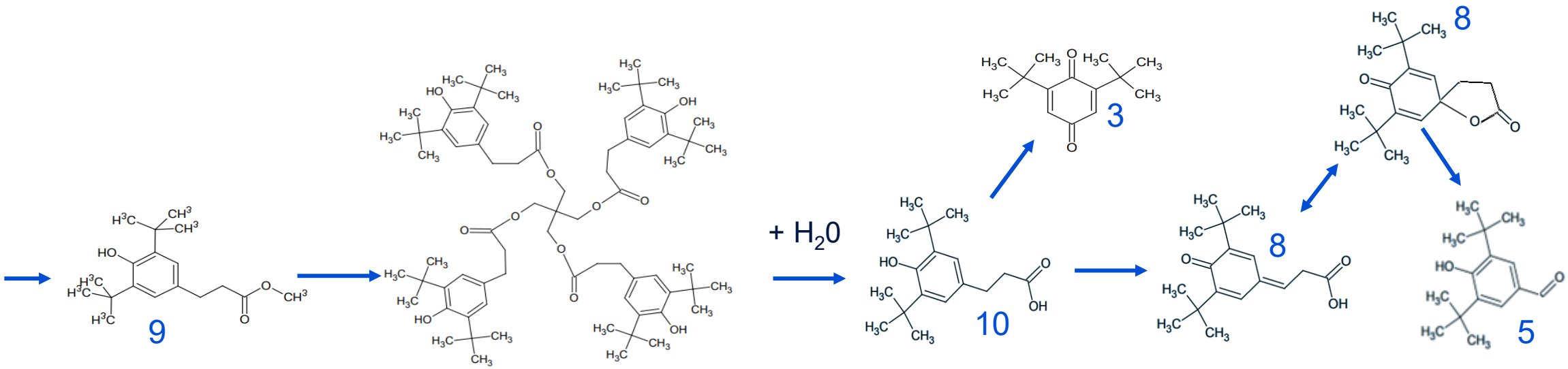
Drive for more data
Actively contributing to various research programs regarding microplastics: MARII, Momentum, supporting the ICCA additives database (to be announced at ICCM5-sept 2023)

Arvin substances
Support toxicologist PhD studies – dedicated to understanding neurotoxicity and Arvin substances
Development of reliable analytical methods for detection of Arvins in solids

3 Example for NIAS: Arvin components and how LYB deals with them

Sources for Arvin substances found in migration water of polymer pipes

Reactions of phenolic (Arvin) substances in the lifecycle of one specific antioxidant[1]



Synthesis of precursors of antioxidant → Synthesis of antioxidant → Hydrolysis → Further reactions

1 The scheme above does not show exact chemical reactions with all reaction partners involved – just the phenolic moieties are followed up for better clarity

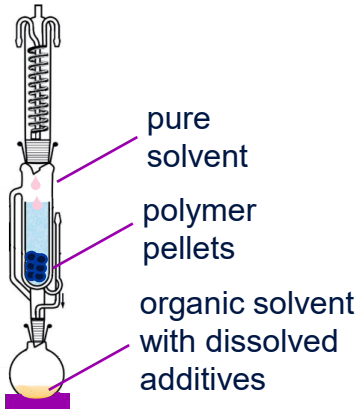
The synthesis of antioxidant starts already with Arvins

Methods for detection of Arvin substances in the polymer and migration water

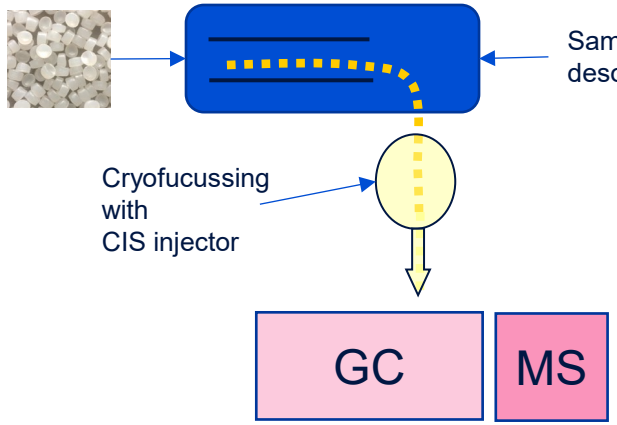
Sample preparation for polymer samples

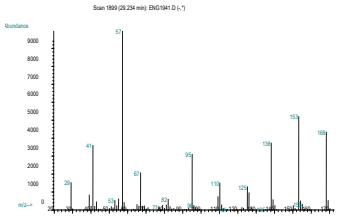
Extraction of additives

- solvent and equipment must be extremely clean
- solvent is not allowed to react with additives
- concentration / volume needs to be adapted requiremenst of measurement equipment



Detection using GCMS, TDS GCMS or HPLC-TOF dependend on detailed analytical question



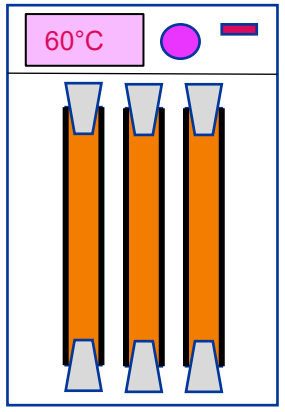


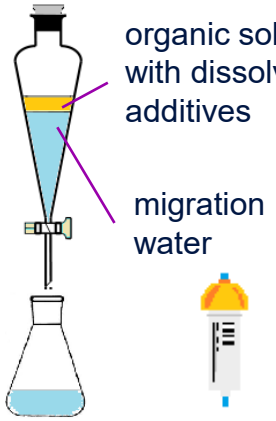
Searchable mass spectrum database

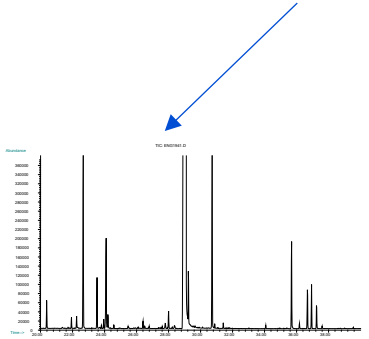
Sample preparation from migration water

Extraction of additives from water into organic solvent

- requirements comparable to polymer extarction
- transfer from water to organic solvent (solubility ?)







Sample Chromatogram

Challenging to perform Arvin analytics at ppb level reliably in routine labs

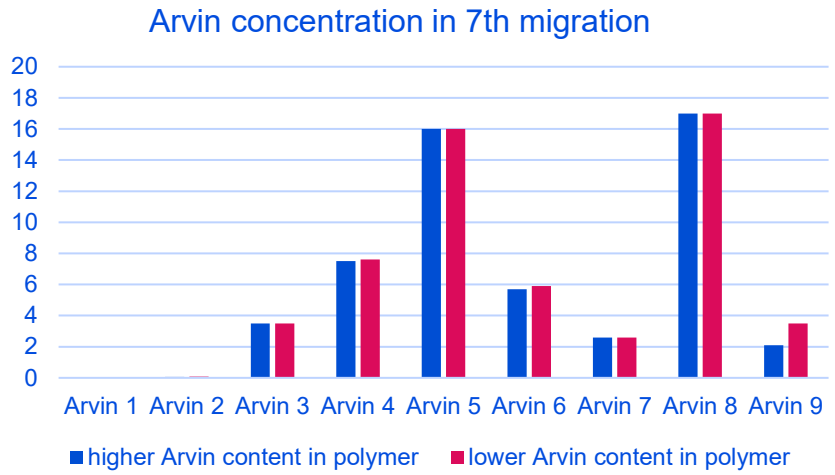
LyondellBasell approach to meet current and future requirements with respect to Arvin

LyondellBasell tried to reduce the Arvin amount without changing the recipe

As additives are made using phenolic precursors the additives themselves already contain Arvin substances as byproducts

LYB analyzed the contribution of these byproducts

Additives containing a lower amount of byproducts resulted in lower Arvin concentration in the polymer but in migration water only incremental differences were found

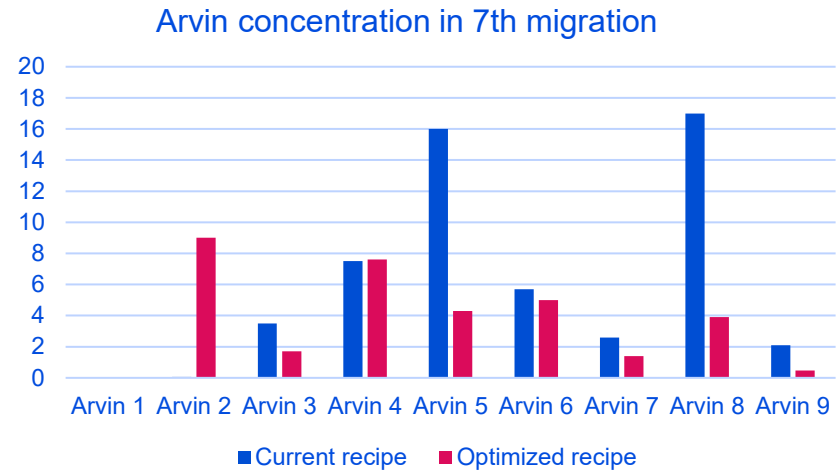


LyondellBasell is working on new additive recipies including evaluation additives not typical for pipes

LYB evaluated successfully new recipes for PE and PP with reduced or no Arvin concentrations in migration water

Besides meeting of future Arvin limits the new recipes need to fulfill various other requirements typical for PE, PP and PB-1 pipes

In case of new additive in recipes migration water needs to be screened for new by- or reaction products



Challanges for polyolefin based drinking water pipes due to regulation for Arvin substances

Applied and upcoming limits for Arvin substances

	Denmark[1,2]	UK [DWI][1]	France[3]	EU (Draft)[3]	Comment
	MTC tap [µg/l]	MTC tap [µg/l]	MTC tap [µg/l]	MTC tap [µg/l]	
Arvin 1	0,5		0,1	0,1	
Arvin 2	0,5		2,5	2,5	
Arvin 3	5,0		2,5	2,5	
Arvin 4	5,0		250,0	250,0	
Arvin 5	0,5		0,1	0,1	UBA is working on scientific proof that Arvin 5 is an artefact (created in GC from Arvin 8)
Arvin 6	1,0		2,5	2,5	
Arvin 7	2,0		2,5	2,5	
Arvin 8	1,0	2,5	1,0 or 2,5	2,5	Toxicology study performed on request of Elisana may allow to increase limit New limit of 100 µg/l seems to be possible – under discussion with authories)
Arvin 9	1,0		50,0	50,0	
Arvin 10					

1 For exterior Pipes
2 For interior pipes < 2µg/l – Sales with Swedish, Netherlands or German drinking water approval possible
3 For chlorinated and not chlorinated water

New recipes with promising results developed – final Arvin requirement setting for EU still pending

4 Questions?

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