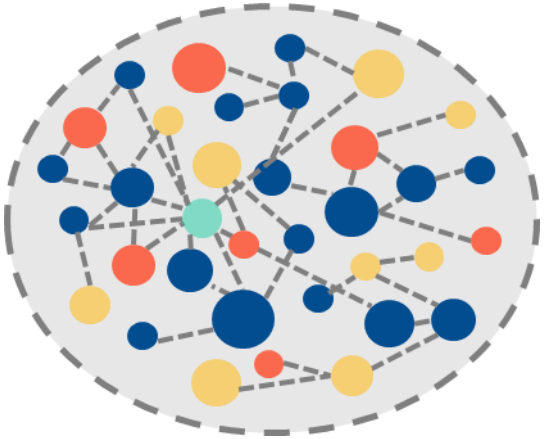
INTRODUCTION

CATALISTI

CATALYSING INNOVATION AND TRANSITION
IN CHEMISTRY AND PLASTICS

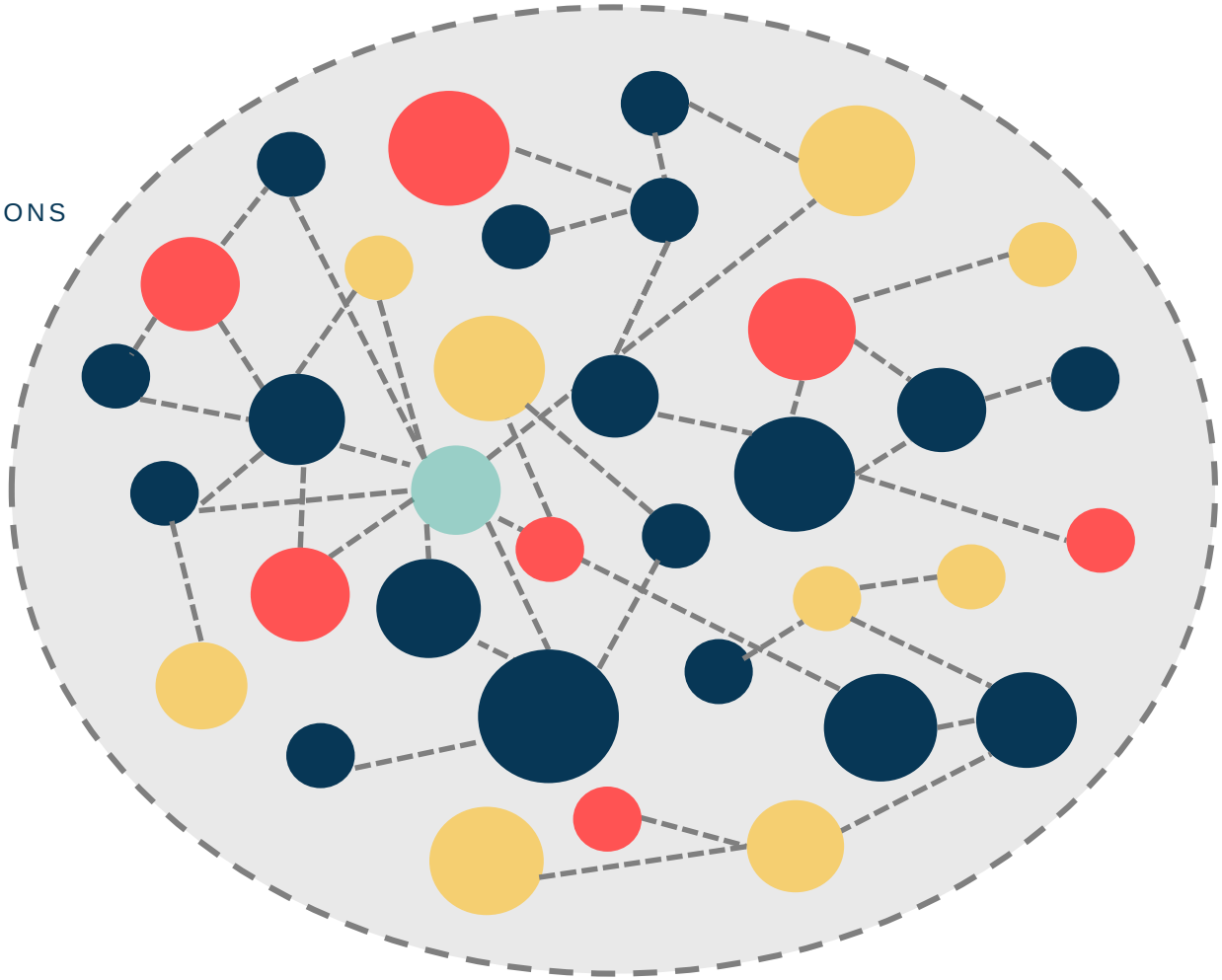
CATALISTI

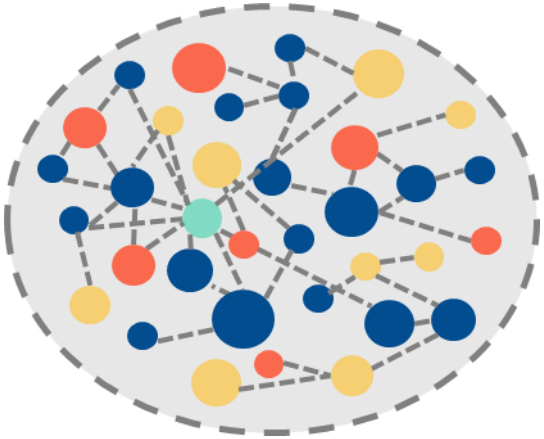


A TEAM OF SPECIALIST WHO FIND, FACILITATE AND FULFILL INNOVATION PROJECTS IN THE **CLUSTER NETWORK**

Cluster Chemistry and Plastics

- Companies & Federations
- Research institutions
- Governments
- 'Triple helix'
- Catalisti





A TEAM OF SPECIALIST WHO **FIND, FACILITATE AND FULFILL** INNOVATION PROJECTS IN THE CLUSTER NETWORK

TRIPLE F PRINCIPLE

FIND

IDENTIFY AND INITIATE INNOVATION OPPORTUNITIES

FACILITATE

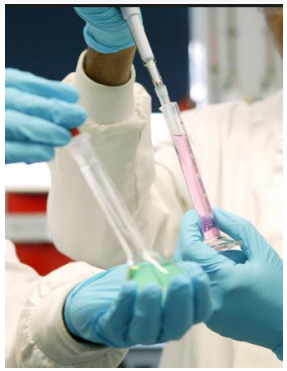
OFFER EXPERTISE AND ACCESS TO RESOURCES

FULFILL

CATALYSE COLLABORATION BETWEEN COMPANIES AND KNOWLEDGE CENTRES

CATALISTI'S DOMAIN OF ACTIVITY

FUNDAMENTAL RESEARCH	APPLIED RESEARCH	PROOF OF CONCEPT	PROTOTYPE	PRE-PRODUCTION	PRODUCTION & DOWNSTREAM

CATALISTI PROGRAMS

RENEWABLE CHEMICALS

USING NATURE'S POWER

PROCESS INTENSIFICATION

FASTER, SMALLER, BETTER

SIDESTREAM VALORISATION

WASTE BECOMES RESOURCE

ADVANCED SUSTAINABLE PRODUCTS

CLEAN AND GREEN

Catalisti: Projects concerning SVHC

Maia: Manufacturing of Advanced & Innovative bio-Aromatics

- utilize the natural functionality of biomolecules by catalytically converting waste wood into lignin fractions and a solid cellulose pulp
- main focus on the production of aromatic molecules

Replacement for BPA from renewable sources

Substance of very high concern (SVHC) and included in the candidate list for authorisation.

Some uses of this substance are restricted under Annex XVII of REACH.

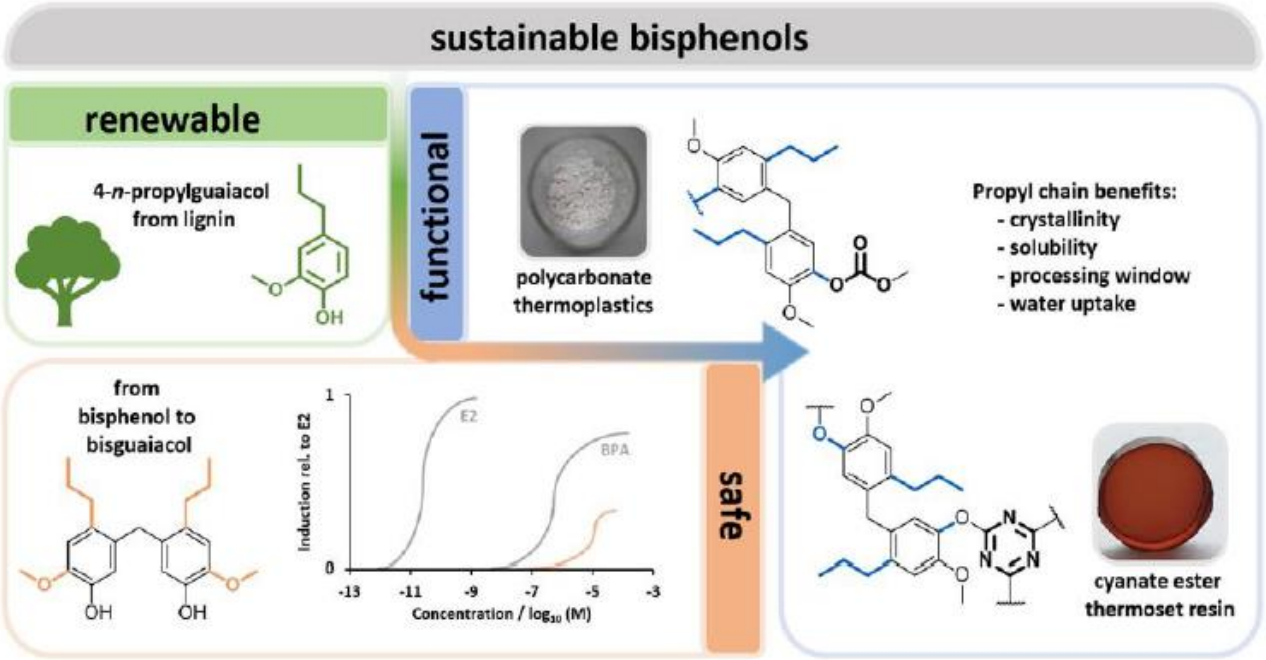
- Possible replacement for BPA found via project
- Biobased does not always result in safer products!

Polycarbonates and poly(cyanurate)

Green Chemistry

PAPER View Article Online

Bio-based thermoplastics and thermosets



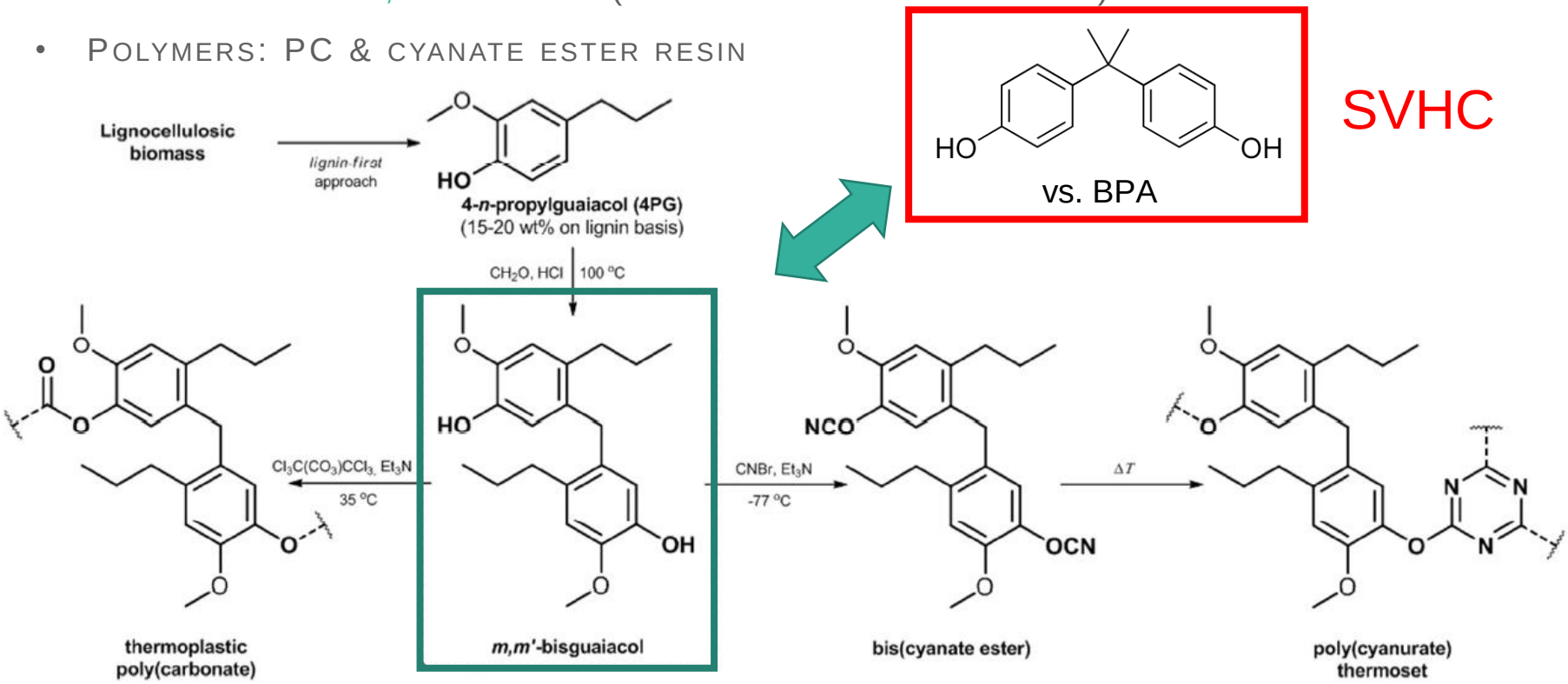
Sustainable bisphenols from renewable softwood lignin feedstock for polycarbonates and cyanate ester resins
Steven-Friso Koelewijn,et al.
Green Chem., 2017, Accepted Manuscript
DOI: 10.1039/C7GC00776K, Paper

KU LEUVEN

Case study: m,m'-BGF-4P bisphenol

Prof. Sels (KUL, MAIA & ARBOREF)

- Ligning-first approach
- New monomer: m,m'-BGF-4P (15-20 wt% on lignin basis)
- Polymers: PC & cyanate ester resin



Scheme 1. Synthesis, purification and estrogenic activity testing of *m,m'*-bis(4-*n*-propylguaiacol) and its potential as precursor to thermoplastic polycarbonates a cyanate esters thermosetting res

Case study: m,m'-BGF-4P bisphenol

- comparison with BPA
- broader liquid state processing window
- Estrogenic potency is lower!

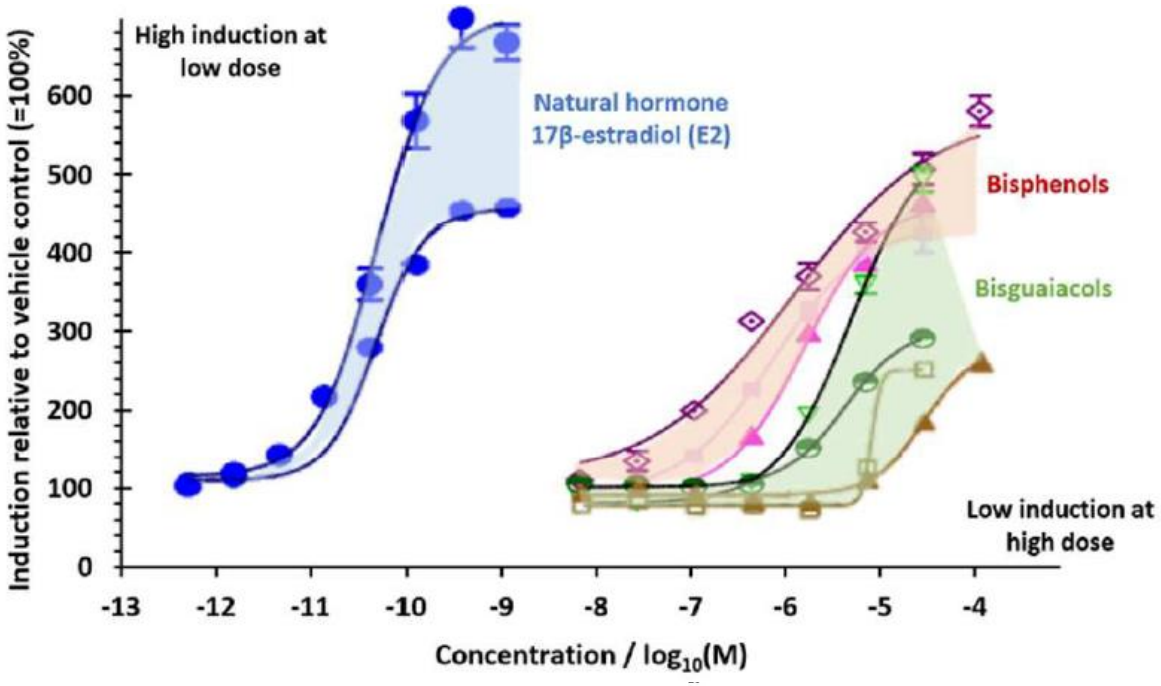


Figure 3. *In vitro* screening of the estrogenic potency of bis(4-alkylguaiacol)s *via* an estrogen-responsive reporter assay in human MCF-7 cells (MELN-assay). Three zones of sigmoidal responsiveness are indicated for reference estrogen (blue), commercial bisphenols (magenta) and bisguaiacols (green). The individual test compounds: E2 (blue, ●), BPF (dark mag., ◇), BPA (light mag., □), BPE (mag., ▲), 4-methyl- (light green, ▽), 4-ethyl- (dark green, ◓), 4-*n*-propyl- (light brown, □) and 5-methyl- (dark brown, ▲) bisguaiacols.

Monomer	T_m (°C)	T_{max} (N_2) (°C)
m,m'-BGF-4P	78	293
m,m'-BGF-4E	129	247
m,m'-BGF-4M	138	244
BPA	158	244
BPF	163	219

FREEFOAM

FUNCTIONAL REACH COMPLIANT, ECOLOGICALLY AND ECONOMICALLY RESPONSIBLE FOAMING OF POLYMER PRODUCTS

SCREENING AND CHARACTERSIATION OF FOAMING AND NUCLEATING AGENTS

→

SUBSTITION OF EXOTHERMIC FOAMING AGENTS BY ENDOTHERMIC ONES OR COMBINATIONS

→

(SEMI)-INDUSTRIAL TRIALS

CHARACTERISATION OF THE FOAM STRUCTURES

REPLACEMENT FOR ADCA (AZODICARBONAMIDE):

- ADCA IS ON CANDIDATE LIST FOR EVENTUAL INCLUSION IN ANNEX XIV OF REACH (SVHC LIST)
- PRO-ACTIVE MEASURES FOR POSSIBLE REPLACEMENTS

RESULTS:

- COMPANIES ARE INFORMED OF CHANGES IN LEGISLATION
- ALTERNATIVES ARE SUMMARIZED AND TESTED
- STUDY IS STARTING POINT FOR DEVELOPING NEW FOAMING AGENTS

- MORE INNITIATIVE FROM COMPANIES IF ADCA WOULD BE SVHC?

FROPTIPLAST

FLAME RETARDANTS FOR OPTIMAL PLASTIC APPLICATIONS

- TO MAKE AN INVENTORY OF THE AVAILABLE FLAME RETARDANTS, SYNERGISTIC EFFECTS AND THEIR USEFULNESS FOR PLASTICS (PROCESSING) COMPANIES
- TO MAKE AN INVENTORY OF THE RECENT RESEARCH LANDSCAPE (PATENT SEARCH) AND LATEST TECHNIQUES (THE SO-CALLED STATE-OF-THE-ART)
- TO MAKE AN INVENTORY OF AND UNDERSTAND THE REGIONAL AND EUROPEAN REGULATIONS, ENVIRONMENTAL LEGISLATION AND TOXICOLOGY
- TO DEVELOP A METHODOLOGY FOR FLEMISH COMPANIES TO HELP THEM UNDERSTAND THE LATEST REGULATIONS AND TO HAVE THEIR PRODUCTS COMPLY WITH THESE REQUIREMENTS

EXAMPLE:

Bis-guanidinium phosphate	-	5423-23-3	No restrictions	No classification
Nitrogen phosphonic salt	-	84402-58-4	REACH registered No restrictions	No classification
Boric acid	-	10043-35-3 / 11113-50-1	REACH registered Annex XIV, Substance of Very High Concern	Toxic for reproduction
Diboron trioxide	-	1303-86-2	REACH registered Annex XIV, Substance of Very High Concern	Toxic for reproduction
Trixylyl phosphate	TXP	25155-23-1	REACH registered Annex XIV, Substance of Very High Concern	Toxic for reproduction
Alkanes, C10-13, chloro (Short Chain Chlorinated Paraffins)	-	85535-84-8	REACH registered Annex XIV, Substance of Very High Concern (PBT)	Possible Carcinogen May cause skin and eye irritation
Tricresyl phosphate	TCP	1330-78-5	REACH registered	R62, R50/53
Bisphenol-A bis(diphenylphosphate)	BDP	181028-79-5 5945-33-	REACH registered	R53

Take-away message

- Catalisti offers support to innovative projects within Chemistry and plastics in Flanders
- Projects need to fit with at least one of our programs:
  - ✓ Renewable chemicals
  - ✓ Process intensification
  - ✓ Sidestream valorisation
  - ✓ Advanced sustainable products
- Within these programs, different projects come in contact with Reach:
  - Discovering new substitutes
  - Proactive search for substitutes
  - Dissemination of information concerning reach

MEET THE CATALYSTS