

FISCH Thematic Workgroup

“Effective chemical product”

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Subject: Thematic workgroup on “Effective chemical product” dd. 19/02/09

On February, 19th, 2009, a Thematic Workgroup (TWG) Meeting was organized by Essenscia in the framework of the FISCH IWT Feasibility Study at GUGA, Diegem (Brussels). Four different TWGs on 1) Catalysis, 2) Novel process technologies, 3) Petroleum replacement, and 4) Effective chemical product individually discussed possible breakthrough projects for their technical theme and built roadmaps for these breakthrough projects. In this Technical Report, the findings of the TWG on “Effective chemical product” are summarized.

The major outcome of the Thematic Workgroup Meeting was that a visionary project for “Effective chemical product” could be a:

***(SME)counter:** this would be a counter where industries from the chemical value chain (multisectoral and including SME's) can meet researchers and where it is possible to find sustainable solutions for all matters related to chemical products and design.*

1. Attendees

Industry

Essenscia:	Carl Van der Auwera
Essenscia:	Tine Cattoor
Polygonia/Federplast:	Sarah Gillis
VKC:	Kristof Callewaert

Knowledge-based Centers

Plan C/KULeuven:	Karel Van Acker
Universiteit Antwerpen:	Genserik Reniers
Universiteit Antwerpen:	Vera Meynen
Universiteit Gent:	Steven De Meester
Universiteit Gent:	Sam Verbrugghe
VUB:	Els Tourwé
KULeuven:	Peter Van Puyvelde

Representatives

VRWB: Vincent Thoen
VOKA: Peter Verboven

Facilitator

BECO:

2. Introduction

On the basis of initial response, gained by a written questionnaire among all FISCH participants, a compilation of relevant research themes and breakthrough domains in the field of sustainable chemistry was made by Carl Van der Auwera. The outcome of this compilation was presented at the Start Event of FISCH on December, 17th, 2008. On the basis of this compilation, four different major **breakthrough domains** could be identified, more specifically:

1. Catalysis
2. Novel process technologies
3. Petroleum replacement (using biomass feedstock)
4. Effective chemical product

For each of these major breakthrough domains, a Thematic Workgroup (TWG) was organized to further elaborate on these themes. For the breakthrough domain/TWG on "**effective chemical product**", the following **relevant research themes** were identified on the basis of the questionnaire:

- (nanotechnology = SIM)
- Materials with built-in functions/triggers (smart materials), biodegradable chemicals/materials (specific degradation of chemical, triggers for recyclability)
- Fast tox-screening for new products
- Replacing solvents and hazardous substances
- Preventing hazardous substances or their metabolites to end up in the environment
- Chemical substances with less residues in food products and in the environment
- Sustainable product design
- Cradle-to-cradle
- Chemical leasing

In addition, on the basis of these relevant research themes, some possible **breakthrough projects** were identified and compiled by Carl Van der Auwera before the TWG came together. For the TWG on "Effective chemical product", the following possible breakthrough projects were already identified:

- A Flemish O⁶-platform for sustainable product design
- Chemical leasing
- Development of new products
- New monomers

3. Identification of one visionary breakthrough project

The aim of the first part of the TWG session was to define one major (visionary) breakthrough project in the field of "effective chemical products".

The meeting was started by Carl Van der Auwera, who presented the relevant research themes and possible breakthrough projects, followed by a presentation of Steven De Meester about new monomers as recyclable building blocks for synthetic materials.

After the presentations, the attendees discussed about the possibilities of integrated or visionary projects for Flanders within the breakthrough domain "effective chemical products".

This is a summary of the discussion:

There is already a lot of action concerning sustainability. Given examples:

- The Netherlands: high throughput
- Clean building: an organization where one can get advice about sustainable building. Is something like this possible and necessary for (chemical) products?

Several consortia have already started worldwide. If we want to realise something in Flanders, a good focus will be important. We need technical innovation, but horizontal thinking will also be important: clustering of knowledge!

It's not the purpose of this workshop to find all solutions, but to give a good kick-off based on the results of the questionnaire.

Remarks on the list with research themes

- Nanotechnology will be a theme for SIM
- Fast tox-screening is important for chemical products and for their metabolites!
- It's important that chemicals are biodegradable, but it's also important that they are recyclable
- Replacement of solvents, preventing of hazardous substances in the environment and less residue in food products and environment belong more or less together
- Triggers for more functionality and recycling are very important: we need to keep this in mind during the development of new products

Additions

- Traceability: it's important that producers know what the quality and toxicity of the available chemical products is. Quickly knowing the history of a chemical product would make it possible to find the optimal applications. Is it possible to make an (online) databank? Or is this too difficult and impossible for Flanders. Or can we become a world leader?
- Most producers keep only 1 life cycle in mind. It's important to think further, because at the moment it is very difficult to find applications for recycled products. That's why 'product to system' thinking will be very important: long-term and cyclical thinking. We have to think about the possible applications of a chemical product after recycling during design phase.

Result of the discussion:

The visionary project could be a (SME)counter

This could be a multisectoral project where:

- projects concerning effective chemical products can be started and coordinated and where industry from the chemical value chain and researchers are linked
- producers and consumers can get advice (counter-function) on all matters regarding chemical products and design: doing more with less, safer and less toxic chemical products, the optimal applications of chemical products,...
- chemical leasing can be organized (possibility for the traceability idea)
- labels and indices can be used. An example is the idea to give an indicator regarding quality and toxicity ("product life indicators") to products. It's possible to make a gradient of sustainability, so that everyone knows the possible applications and economical value of each class of products. It will be also possible to recycle products to a new product with a higher sustainable gradient instead of to the same product (example PET).
- a 'productbank' can be integrated. The platform manages all chemical products and has an overview of the complete life cycle of the products, whereas now everyone has an overview of his small part of the life cycle (traceability?). Companies can go to the counter and ask for the optimal chemical product they need. Or is this too visionary?
- plans can be made to use resources and energy more efficiently, which can give us a big economical advantage

The biggest problem is the interest of the companies for this platform.

Everyone needs to know that it exists and that there is an economical advantage related to this platform. IP can also be a big problem.

Can we link with European platforms? Or can we become a world leader?

SWOT & ROADMAP:

Flemish (SME)counter “effective chemical product”

<p style="text-align: center;">Strenghts</p> <ul style="list-style-type: none"> - High concentration and quality of knowledge institutes and industries - Flanders is small, but is: <ul style="list-style-type: none"> • N°1 in EU (cluster) • N°1 downstream • N°1 upstream • N°1 in collecting & processing garbage - Flanders has a great variety of industries in the chemical value chain - Synergy between sectors is possible - Strong logistics and infrastructure 	<p style="text-align: center;">Weakness</p> <ul style="list-style-type: none"> - Fragmentation of knowledge & research and lack of vision - Lack of entrepreneurship (conservative SMEs) - Lack of communication and collaboration - Knowledge concerning chemistry and sustainability lacks at non chemical industries - Lack of energy & resources and no big suppliers of biobased resources - Still too much waste - Lack of connection to large international projects - Negative image of chemistry
<p style="text-align: center;">Opportunities</p> <ul style="list-style-type: none"> - Active or proactive following and influencing of the EU legislation - Link with European initiatives - Linking with initiatives like SIM, PLAN C, FLAMAC, FlandersInShape, ... - Society is ready for sustainable initiatives - Possibility of intra/intersectoral collaboration: further forming of clusters (leverages for SMEs) - Technology & creativity in Flanders - Eco-consciousness - Sustainability is economically profitable in the long-term - More expensive resources → alternatives 	<p style="text-align: center;">Threats</p> <ul style="list-style-type: none"> - R&D and head of decision often abroad (bigger companies) - Limited overview of markets and consumers - Low belief in sustainable products being profitable - Brain drain - IP - Existing international and local initiatives: can we find the blue ocean?

	Now	2015	2020	2025
Society	REACH Ecodesign directive Sustainable production & consumption (EU legislation) Climate goal Eco-consciousness Expensive resources Improving image of chemistry		Climate goal 2020	
Markets	Biobased products Recycled products Open innovation Local materials (transport)	Leader chemical leasing Use new monomers Decrease toxic substances	Effective product and energy flows Effective products	World leader 'effective chemical products' Advice and steer legislation
Products & technologies	Inventories, technological roadmaps, and projects Collaborations Market surveys Making an inventory of the starting position of Flanders (needs and wishes, tools, channels, institutes, knowledge centres, technological barriers, sector flows: where are the losses, product flow databases,...) Definition of 'sustainable products' + indicators	R&D results, case studies & spin-offs Optimization/valorization of product flows (analogous to the food industry) Making sustainability measurable Labels	SME+ industrial services and development Traceability Transparency of management Downcycling & upcycling of chemical products (optimal use of a product and recycling after usage to a sustainable and high quality product)	International R&D and services Life cycle management: cyclic product management Integration of wellbeing management systems Efficient energy and product flows Prevention and measurement of toxic chemicals and their residues New business models for chemical products

Projects	<p>Chemical leasing Decomposition of polymers to monomers Polymerization of nature's bifunctional building blocks Chemical or physical incorporation of CO₂ in chemical products Triggers for product effectivity Sustainable design Cradle to cradle/recycling of chemical products Improve logistic organization New tools to speed up chemicals development (high throughput, pilot plants, application labs)</p>	<p>Product indicators for quality and toxicity Traceability; product history New detection of materials: nanolabeling ⇒ Online monitoring Valorization of product flows Clustering and integration of chemical sites Making products and processes more sustainable than at present</p>	<p>(SME) counter (50% SMEs activated) "Product life indicators"</p>	
Partnerships	<p>Partnerships concerning sustainable products with existing initiatives (SIM, Flamac, MIP, PLAN C, Flandersinshape) Synthetic industry Packing industry</p>	<p>Partnerships concerning product safety, toxicity and product flow valorization Food industry Textile industry Chemical producers</p>	<p>Partnerships between researchers and the industries from the complete chemical value chain</p>	<p>European partnerships</p>