Moving on

Annual Report 2016

DPI
The Polymer Research Platform

Foreword
Moving on

For DPI, 2016 was a year of transition – a transition towards the new operational structure approved by the Supervisory Board at the end of the previous year. This meant laying the necessary operational groundwork for a smooth changeover. As announced earlier, DPI's funding will now primarily come from its industrial partners, supplemented with whatever funding can be obtained from other sources such as government agencies. Close industrial involvement will continue to be the cornerstone of the successful DPI concept. Industrial commitment – reflected in a substantial industry participation level – is therefore a precondition for the continuation of the DPI collaboration platform.

New Basic Research programme
Although industry participation in the new setup has so far lagged behind the targeted level, the Supervisory Board has decided there is sufficient commitment for setting up a new research programme. This new programme will address topics relevant to the chosen end-markets: oil & gas, building construction, packaging, electrics & electronics and automotive. Meanwhile, DPI will continue to make efforts to attract more partners, so that research volume can be maintained at a viable level in all Programme Areas. As things stand now, the distribution of industrial partners between the areas is uneven: for example, the participation level in Polyolefins is much higher than in the other areas. We hope to have a more balanced distribution in the future.

Applied Research
The DPI research programme mainly consists of Basic Research, aimed at enhancing existing knowledge of polymers. Where projects involving Applied Research are carried out, these are "on top of" the Basic Research and must be initiated by a full partner in DPI. In the past, such projects mostly occurred in the framework of EU programmes. In 2016, based on our experience with EU projects, we worked out in detail the requirements for carrying out Applied Research projects. This has led to the decision that DPI will undertake such projects also in a non-EU context, provided the lead is taken by a company that is a full participant in DPI's Basic Research programme.

Governance
DPI has opted to retain its existing incorporation as a single foundation, as this was deemed to be the most effective and efficient way forward. However, in view of the recent changes in the composition of our industrial partner base, some changes had to be made in governance to accommodate both the old DPI 1.0 programme and the new DPI 2.0 programme. The Articles of Association were revised to allow for the parallel execution of two research programmes. For the same reason, a new structure was adopted for the Council of Participants: it was decided to have two mutually exclusive Councils of Participants, one for DPI 1.0 and one for DPI 2.0. As part of several organisational measures taken in 2016, the Supervisory Board decided not to fill the position of DPI Scientific Director for the time being.

Modification of IP Rules
The modified IP rules adopted in 2014 are now firmly in place and are expected to give us wider scope for sourcing academic research services. Under the previous rules, any IP rights arising from DPI research projects came into the possession of DPI and the participating companies had the possibility to acquire these rights through the system of right of first refusal and via negotiation with DPI. The modification was necessary as the rules were not always compatible with the diverse nationalregulations in the countries where DPI's academic partners are based. Under the new rules, the IP rights are owned by the university where the invention was made and can be acquired by one or more industrial parties involved in the research through direct negotiation with the university.

Scientific quality

DPI continues to deliver a high volume of scientific output of a consistently high quality recognized by the international scientific community. In 2016, DPI projects resulted in 20 PhD theses and 90 scientific papers published by researchers working on DPI projects. At 5.63, our Average Journal Impact Factor for 2016 remained at the high level sustained over the past several years.

Being a year of transition, 2016 saw a mixed bag of activities: we simultaneously worked on the completion of the running Basic Research programme (DPI 1.0) and on setting up a new research programme (DPI 2.0). The latter is now well underway and developments look promising. We are confident that the various initiatives we took in 2016 will result in growth and help us to secure the future of the DPI research platform.

Jacques Joosten – Managing Director

J. Joosten

DPI TEAM – Top row: Thomas Manders, Jan Stamhuis, Jacques Joosten and Christianne Scharff-Bastiaens
Second row: Monique Bruining, Peter Kuppens, Jeanne van Asperdt, Renée Hoogers and Linda de Wit
Absent in this picture: Arie Brouwer, Denka Hristova-Bogaerds, Ronald Korstanje

Contents

Organisation 2016

Supervisory Board

- **Dr. H.M.H. van Wechem**, *Chair*
- **Dr. D. Boersma**
- **J. de Jeu, MA MSc**
- **Dr. F. Kuijpers**
- **Prof. K.C.A.M. Luyben**
- **Dr. J.A. Roos**

Executive Board

- **Dr. J.G.H. Joosten**
  Managing Director, Chair
- **Prof.dr. S. van der Zwaag**
  Scientific Director (left in 2016)

Programme Area Coordinators

- **Dr. M.J. Bruining**
  Coatings Technology
- **Dr. D.G. Hristova-Bogaerds**
  Performance Polymers
- **R.J. Korstanje, MSc**
  Functional Polymer Systems
  Large-Area Thin-Film Electronics
- **Dr. J.E. Stamhuis**
  Polyolefins
  Polymers for Oil and Gas

Scientific Programme Chairs

- **Prof.dr. V. Busico**
  Polyolefins
- **Prof.dr. C. Creton**
  Performance Polymers
- **Prof.dr. S. van der Zwaag**
  Coatings Technology (left in 2016)

Organisation Staff

- **A.F.J. van Asperdt**
  Financial Administration
- **Dr. M.J. Bruining**
  General Affairs
- **R.P.F. Hoogers-Valken**
  Secretariat
- **P.J.J. Kuppens, AA**
  Controlling
- **C.H.L.M. Scharff-Bastiaens**
  Communications
- **L. de Wit**
  Project Administration

Staff European projects

- **A. Brouwer, MSc**
  Project Manager SEAFRONT
- **Dr. D.G. Hristova-Bogaerds**
  Project Manager EMMC-CSA
- **R.J. Korstanje, MSc**
  Project Manager SHINE
- **L. de Wit**
  EU Project Office

DPI: International Centre of Excellence in Polymers

In the last few years DPI has transformed itself into an International Centre of Excellence in Polymers. To achieve that goal, the institute has expanded its pre-competitive research programme with projects focusing on pre-commercial application themes.

Pre-competitive research programme

DPI's pre-competitive research programme currently embraces five programme areas. Companies and knowledge institutes can participate in one or more of these areas, each of which encompasses a substantial number of projects. The participating companies jointly define the programme content for the programme areas in which they participate. PhD students and post-docs from our partner knowledge institutes perform their research in close collaboration with scientists from our industrial partners. Shaping that collaboration between industry and academia is the key to building a coherent community that delivers research results to the envisaged high standard and prepares our scientists for their future careers, in industry or elsewhere.

PRE-COMPETITIVE PROGRAMME

DPI Rules & regulations apply to all projects

Polyolefins		**Performance Polymers**	
13 projects		**16 projects**	
Industry • Borealis • Braskem • Dow Benelux • DSM • ExxonMobil • Lanxess Elastomers • Michelin • Reliance • SABIC • SCG Chemicals • Sinopec • Teijin Aramid	**Academia** • Eindhoven University of Technology • ESCPI-Lyon • Fraunhofer Institute for Structural Durability and System Reliability LBF • Johannes Kepler University Linz • Lomonosov Moscow State University • Loughborough University • Martin-Luther University of Halle-Wittenberg • National Council for Scientific and Technological Development (CNPq) • National Interuniversity Consortium of Materials Science and Technology (INSTM) • Radboud University • UFRGS Universidade Federal do Rio Grande do Sul • Universidade Federal do Rio de Janeiro • University of Manitoba • University of Naples Federico II • University of Perugia	**Industry** • AkzoNobel • BASF • Bayer • DSM • Food & Biobased Research Wageningen UR • FrieslandCampina • Petrobras • SABIC • SKF • Teijin Aramid	**Academia** • CNRS Strasbourg • Delft University of Technology • DWI an der RWTH Aachen • Eindhoven University of Technology • Food and Biobased Research, Wageningen UR • Foundation for fundamental research on matter (FOM) • National Council for Scientific and Technological Development (CNPq) • National Technical University of Athens • TI Food and Nutrition (TIFN) • Tsinghua University • Universidade Católica de Brasilia • Universidade Federal do Rio de Janeiro • University of Groningen • University of Twente • Wageningen University & Research
Expenditure € 0.93 million FTEs 11.6 (17 researchers)		Expenditure € 1.43 million) FTEs 18.3 (29 researchers)	

Industrial pre-commercial programme

The industrial pre-commercial programme consists of Value Chain projects and EU projects. The conditions for performing Value Chain projects are described below and those for EU projects are in accordance with published EU rules that are available on the relevant websites.

The Value Chain projects offer companies and/or research institutes the opportunity to establish consortia for innovation projects, in which they collaborate within the value chain. Every partner plays an active role in the project, which must be aimed at further development of an innovation. The projects are intended to generate economic activity within the foreseeable future (i.e. no later than two to five years after completion of the project).

DPI's role is to actively assist in establishing the collaboration and to coordinate the project. DPI's role can also be limited to acting as coordinator of a project.

DPI provides a model framework for the collaboration, but the detailed rules are agreed between the members of the consortium. As regards intellectual property, the basic principle is that the knowledge created during the course of the project (foreground knowledge) is the property of the inventing partner, and any background knowledge contributed to the project remains the property of the partner that provided it. Other partners have free access to the knowledge contributed to and/or generated during the project, but only for research purposes and to the extent necessary for developments in the project. Specific agreements are made to enable access to another partner's IP for commercial application of the knowledge outside the project.

PRE-COMPETITIVE PROGRAMME

DPI Rules & regulations apply to all projects

Functional Polymer Systems	Coatings Technology	Large-Area Thin-Film Electronics	Polymers for Oil and Gas
9 projects	**4 projects**	**4 projects**	**2 projects**
Industry • BASF • DSM • SABIC	**Industry** • AkzoNobel • Altana • DSM • Lawter • Saint-Gobain	**Industry** • DSM	**Industry** • Shell • SNF Floerger
Academia • Eindhoven University of Technology • Imperial College London • Max Planck Institute for Polymer Research • University of Groningen • University of Twente • Wageningen University & Research	**Academia** • Changchun Institute of Applied Chemistry • Eindhoven University of Technology • University of Groningen • Wageningen University & Research	**Academia** • Eindhoven University of Technology • Max Planck Institute for Polymer Research • University of Groningen • University of Twente	**Academia** • Delft University of Technology • University of Groningen
Expenditure € 0.43 million FTEs 10.0 (11 researchers)	Expenditure € 0.15 million FTEs 3.7 (5 researchers)	Expenditure € 0.08 million FTEs 3.7 (7 researchers)	Expenditure € 0.10 million FTEs 1.9 (2 researchers)

NEWPOL (New Polymer Materials) programme

DPI is working together with NWO, the Netherlands Organization for Scientific Research, on the NEWPOL (New Polymer Materials) programme. NEWPOL is a public-private initiative focusing on developing new polymeric materials by encouraging cross-pollination between different research fields and disciplines.

DPI has organized the NEWPOL activities as a separate programme area, in which all of DPI's industrial partners are participating. The programme offers DPI a good opportunity to explore the possibilities of this model of cooperation.

The programme encompasses six projects on topics such as:

- colouring paint without pigments
- commodity polymers with self-organizing smart coatings that respond to environ-mental changes by changing color and/or shape
- supramolecular biomaterials for stem cell expansion
- self-synthesizing gels
- development of a SuperActive synthetic biomaterial to repair damaged tissues in the body
- flexible memories made from coordination polymers.

Four projects have started in 2016, the other two will start early 2017.

Universities involved in 2016:

- Delft University of Technology
- Eindhoven University of Technology
- University of Groningen

INDUSTRIAL PRE-COMMERCIAL PROGRAMME

Model framework for collaboration		
Rules and regulations set by involved partners	**Rules and regulations set by involved partners**	**Rules and regulations set by involved partners**
SHINE (1-2-2013/31-7-2016)	**SEAFRONT** (1-1-2014/31-12-2017)	**EMMC-CSA** (1-9-2016/31-8-2019)
Partners • Acciona Infraestructuras • Arkema • BIWI • Cidetec • Critical Materials • Delft University of Technology • DPI • ESPCI ParisTech • Forschungszentrum Jülich • Fraunhofer UMSICHT • MTA-TTK • SKF Engineering & Research Centre • Teijin Aramid	**Partners** • AkzoNobel / International Paint • BioLog • Bio-On • Biotrend • Bluewater Energy Services • Delft University of Technology • DPI • Eindhoven University of Technology • Fraunhofer IFAM • Hapag Lloyd • I-Tech • Minesto • Smartcom Software • Solintel • Solvay Specialty Polymers • University of Bristol • University of Gothenburg • University of Newcastle upon Tyne • Val FoU	**Partners** • Access e.V. • Dow Benelux • DPI • Ecole Polytechnique Federale de Lausanne • Fraunhofer IWM • Goldbeck Consulting • Granta Design • Helmholtz-Zentrum Geesthacht • Materials Design (MDS) • Politecnico di Torino • QuantumWise • SINTEF • TU Wienl • University of York • Uppsala University
Budget € 6.4 million (€ 4.0 million EU subsidy)	Budget € 11.2 million (€ 8.0 million EU subsidy)	Budget € 3.77 million (€ 3.77 million EU subsidy)

DPI Value Centre

2016 was a turbulent year for DPI Value Centre. In the face of reduced support from the Ministry of Economic Affairs and the Top Sector Chemistry, it was decided to scale down the current activities and change the strategy for the future. The scaling down took place parallel to continuation of the highly valued support by the sub-teams in the various regions across the Netherlands. To this end, new agreements were made with the regions so that the team members in each region could continue their work as much as possible. Meanwhile, DPI Value Centre focused on delivering on the agreed activities and supporting SMEs with their polymer innovations.

In 2016 various innovation meetings were organised and new projects were started, such as the Thermoplastic Composites project funded by OPZuid (European funding programme for southern Netherlands) and carried out in partnership with the Brightlands Materials Center. Some highlights of the 2016 meetings and projects are presented below.

Coaching of startups

Startup meetings were held on 7 January, 11 February and 28 April for the benefit of seven young businesses in the fields of materials and process technology looking to accelerate new business development. To help them forward, problems specific to their businesses were discussed and support provided in the form of knowledge, experiences and network contacts.

Partners in Plastics & Rubber on tour

Partners in Plastics & Rubber is an initiative of NRK (the Federation of the Rubber and Plastics Industry in the Netherlands), DPI Value Centre and PlasticsEurope Netherlands launched in 2011. In 2016, in the framework of its “on tour” programme, Partners in Plastics & Rubber traversed the Netherlands in search of companies that could be identified as the gems of the plastics and rubber industry. The aim was to get companies and knowledge institutions to collaborate on developing innovation projects and to underline the importance of regional dynamics for the plastics and rubber industry. In April, 80 participants paid a visit to tyre manufacturer Apollo Vredestein. They were shown around the company’s site and participated in a number of parallel sessions and Innovation Tables. The theme of this first “on tour” activity was circular entrepreneurship in the automotive/B2B sector. Two Innovation Tables were held, intended to lead to the launch of a number of projects within the framework of KIEM-VANG, a subsidy scheme supporting small,

PARTNERS IN PLASTICS & RUBBER ON TOUR
April 2016
Discussions at one of the Innovation Tables

BIOBASED BUSINESS DEVELOPMENT DAY
Focus on biobased packagings

targeted research projects designed to make the most of the circular economy. KIEM stands for Kennis-Innovatie Mapping (Knowledge-Innovation Mapping) in the SME sector and is intended to promote the circulation of knowledge among institutions of higher education and companies. VANG stands for Van Afval Naar Grondstof (From Waste to Raw Material).

The “on tour” meeting in June, with 70 participants, was held at SABIC. The theme was sustainable and industrial construction. In the coming years, climate-neutral construction will be an important goal, offering major opportunities for the reduction of CO2 emissions in the Netherlands. Moreover, climate-smart constructions are a growth market for the industry. Suppliers of plastic and rubber construction products will play a major role in the achievement of the sustainable construction goals.

Smart Supply Chain projects
In 2016, DPI Value Centre teamed up with partners such as NRK on so-called “Smart Supply Chain Collaboration” initiatives to set up projects for the development of sustainable products. Chain-based collaboration will enable an integral approach to the development of solutions and prevent incomplete solutions that turn out to be problematic at the end of the first phase of a project. An example of this approach is the chain project Groothuisbouw, in which a system builder works together with (potential) suppliers to find new and creative applications of plastics in prefab housing construction. The project was started in summer 2016 and will be completed in the course of 2017.

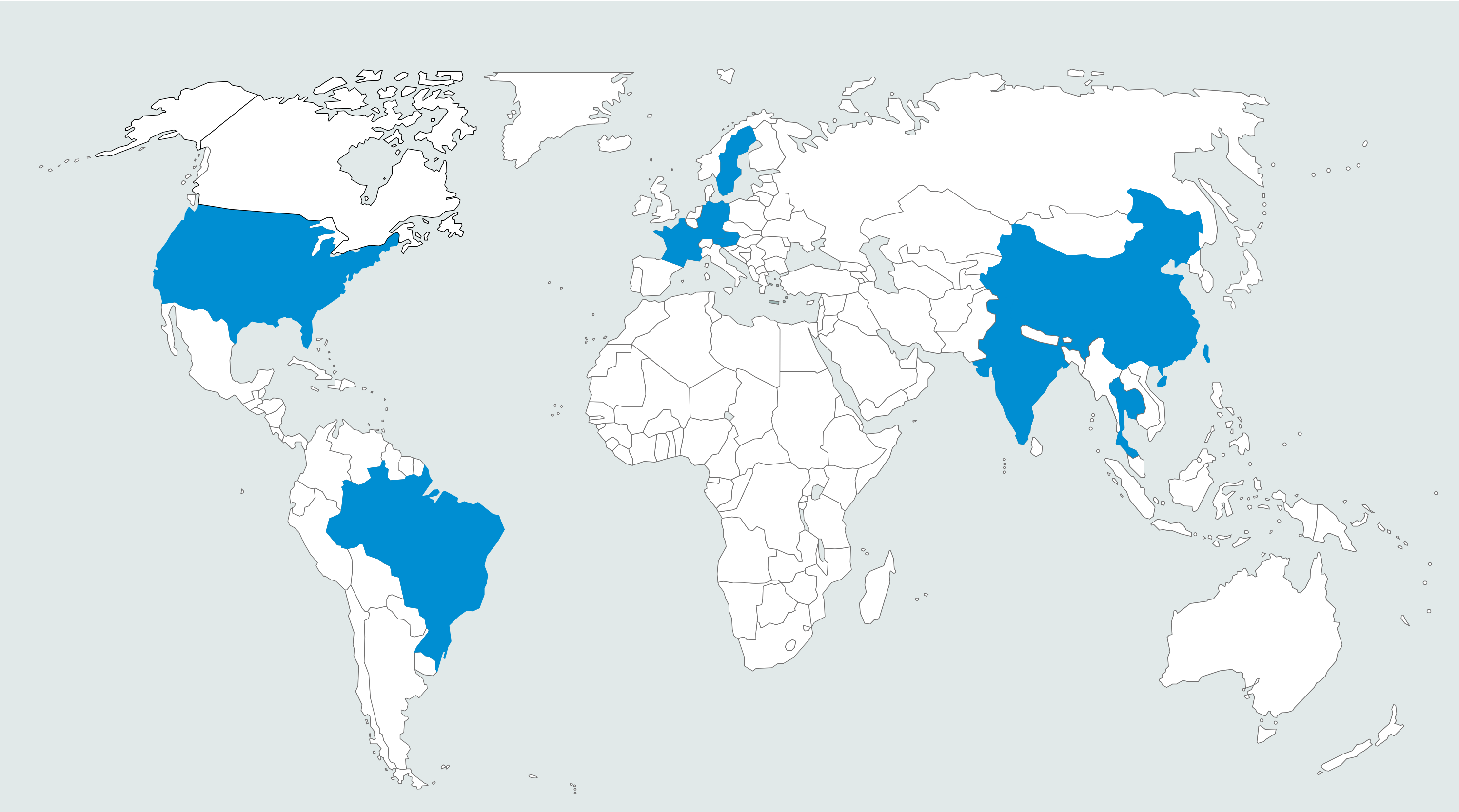
Biobased packagings
A proven DPI Value Centre activity is the Biopolymer Market Day, which brings together suppliers and manufacturers and facilitates the exchange of knowledge and experiences. One of the market days co-organized by DPI Value Centre in 2016 focused on biobased packagings. It was linked up with the “Biobased Business Development Day” organised by Biobased Delta on 29 September. Thanks to this cooperation, a larger number of interested representatives of companies could be reached.

Brightlands Materials Center
The international Brightlands Materials Center (BMC) focused on in three programme areas in 2016: 3D Printing, Lightweight Automotive (LWA) and Optics and Electronics (OE). DPI Value Centre’s business innovation experts were involved in LWA (with a focus on thermoplastic composites) and OE. Their brief: to attract new companies to BMC and thus help it to grow and eventually operate independently of government funding.

In November 2016 the Thermoplastic Composites pilot was launched, aimed at promoting collaboration between companies in the south of the Netherlands in the area of thermoplastic composites. DPI Value Centre played a key role in getting the companies together. Jos Lobée, Project Manager of the pilot project at DPI Value Centre: “We can use this pilot project to provide a boost to innovative applications of thermoplastic composites. We managed to bring a wide range of parties from the industry to the table. It’s great to see that surprising combinations can be created between parties, which otherwise would not have existed.” Marnix van Gurp, Managing Director BMC: “This pilot project dovetails perfectly with our research centre’s Lightweight Automotive programme, in which we are studying the application of composites in the automotive industry. We are developing high-quality expertise in the field of bonding, processing, design and engineering, expertise that can be immediately applied in practice at companies.”

DPI VALUECENTRE

Partners Industry 2016



Europe

ALTANA	Altana
BASF The Chemical Company	BASF (Left DPI in 2016)
Bayer	Bayer
BOREALIS Keep Discovering	Borealis
MICHELIN	Michelin
SAINT-GOBAIN	Saint-Gobain
SKF	SKF
SNF FLOERGER	SNF Floerger

North and South America

Braskem	Braskem
ExxonMobil	ExxonMobil
BR PETROBRAS	Petrobras

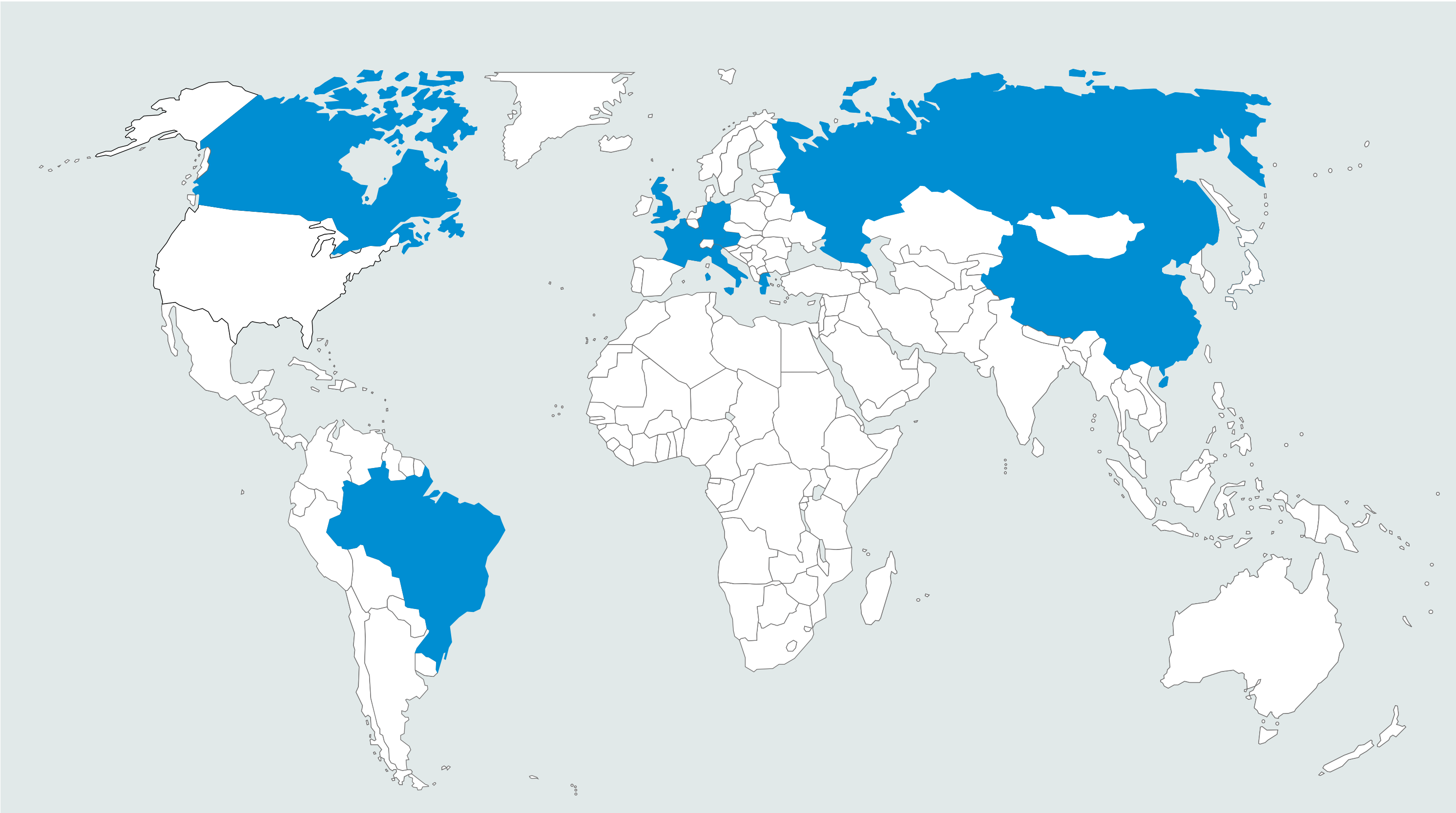
Asia

Reliance	Reliance (Joined DPI in 2016)
SCG Chemicals	SCG-Chemicals
Sinopec	Sinopec

The Netherlands

AkzoNobel	AkzoNobel
Dow	Dow Benelux
DSM	DSM
Food & Biobased Research Wageningen UR	Food and Biobased Research Wageningen UR
FrieslandCampina	Friesland Campina
LANXESS	Lanxess Elastomers
LAWTER	Lawter
sabic	SABIC
	Shell
TEIJIN	Tejin Aramid

Partners Knowledge institutes 2016



Europe

CNRS Strasbourg

DWI an der RWTH Aachen

ESCPE-Lyon

ESRF, Grenoble
(No research projects in 2016)

Fraunhofer Institute for Structural Durability and System Reliability LBF

Imperial College London

Johannes Kepler University Linz

Lomonosov Moscow State University

Loughborough University

Martin-Luther-University Halle-Wittenberg

Max Planck Institute for Polymer Research

National Interuniversity Consortium of Materials Science & Technology (INSTM)

National Technical University of Athens

University of Erlangen-Nürnberg (FAU)
(No research projects in 2016)

University of Haute-Alsace
(No research projects in 2016)

University of Naples Federico II

University of Perugia

University of Turin
(No research projects in 2016)

University of Udine
(No research projects in 2016)

North and South America, Asia

- Changchun Institute of Applied Chemistry
- National Council for Scientific and Technological Development
- Tsinghua University
- UFRGS Universidade Federal do Rio Grande do Sul
- Universidade Católica de Brasilia
- Universidade Federal do Rio de Janeiro
- University of Manitoba

The Netherlands

- Delft University of Technology
- Eindhoven University of Technology
- Foundation for fundamental research on matter (FOM)
- Food and Biobased Research Wageningen UR
- NWO
- Radboud Universiteit
- Universiteit of Groningen
- University of Twente
- Wageningen University & Research

Summary of financial data 2016

Income

Income	(x EUR million)	%
Contributions from industrial partners	3.58	35.9
Revenue Patents	0.04	0.4
Revenue DPI Value Centre	0.33	3.3
Contributions from knowledge institutes	0.76	7.6
Subsidy (TKI Toeslag + NWO)	0.58	5.8
Revenue TKI SPM	0.69	6.9
EU projects	3.99	40.0
Total income	**9.97**	**100**

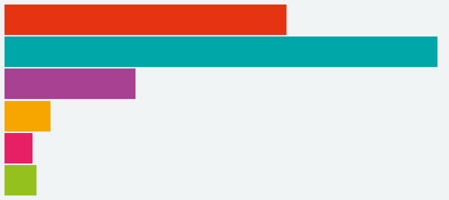
Expenditure

By nature

By nature	(x EUR million)	%
Personnel costs	3.94	45.9
Depreciation	0.01	0.1
Other costs	0.73	8.5
In-kind contribution	0.00	0.0
EU projects	3.90	45.5
Total expenditure	**8.58**	**100**

By Programme Area

By Programme Area	(x EUR million)	%
Polyolefins	0.93	29.8
Performance Polymers	1.43	45.8
Functional Polymer Systems	0.43	13.8
Coatings Technology	0.15	4.8
Large-Area Thin-Film Electronics	0.08	2.6
Polymers for Oil and Gas	0.10	3.2
Sub total	**3.12**	**100**
Knowledge Transfer	0.13	
Organisation and support	1.06	
Support to DPI Value Centre	0.37	
Provision	0.00	
EU projects	3.90	
Total expenditure	**8.58**	



Key Performance Indicators 2016

Number of industrial partners

2015	32
2016	24

European governmental funding (% of total funding)

2015	43%
2016	40%

Number of partner knowledge institutes
(universities, etc.)

2015	35
2016	30

Participation of foreign knowledge institutes
as % of total expenditure

2015	25%
2016	22%

Industrial contribution (cash and in-kind)
as % of total income

End 2015	37%
End 2016	36%

Overhead costs
as % of total expenditure

2015	10%
2016	12%

Subsidy (TKI Toeslag + NWO)
as % of total income

End 2015	0%
End 2016	6%

Expenditure for knowledge transfer
x EUR million

2015	0.11
2016	0.13

Number of patents/reported inventions licensed or transferred to industrial partners and DPI Value Centre

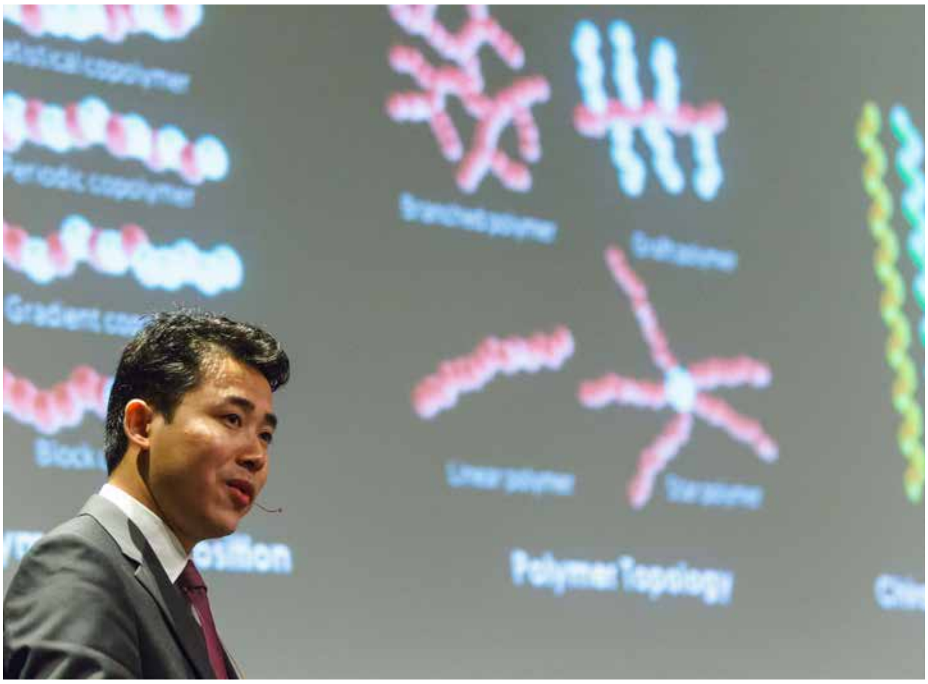
2015	1
2016	2

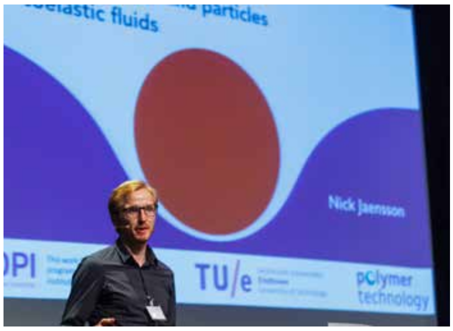
Track record DPI researchers

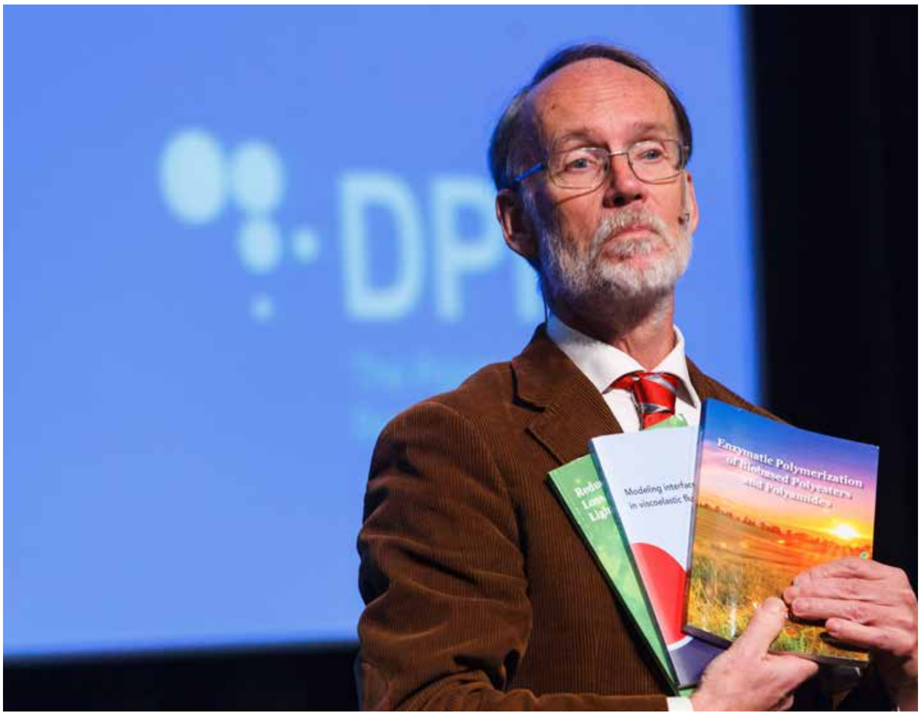
Left in total	28
Employed by partner knowledge institute	9
Employed by non-partner knowledge institute	3
Employed by partner industrial company	3
Employed by non-partner industrial company or start-up	9
Unknown	4

Research output	2015	2016
Scientific publications	93	90
PhD theses	10	20

DPI Annual Meeting 2016







DPI GOLDEN THESIS AWARD 2016
Winner of the award Davood Abbaszadeh

DPI THESES AWARD NOMINEES 2016
Yi Jiang, Davood Abbaszadeh and Nick Jaensson

DPI POSTER AWARD 2016
Winners of the DPI poster prizes:
Enrico Troisi (second prize), Frank van Mastrigt (first prize) Lorenzo Troisi (third prize)

EU projects

For several years now, DPI has been involved – as coordinator or as a partner – in projects forming part of the Framework Programmes (FP7 and Horizon 2020) of the European Union.

SEAFRONT

SEAFRONT (Synergistic Fouling Control Technologies) is a FP7 project started in January 2014 with the aim of developing environmentally friendly coatings that prevent the undesirable accumulation of marine organisms on boats, ships, tidal power plants, fisheries and other aquatic installations. DPI and AkzoNobel are the main contractors of the EU project.

New coatings

The fouling control coatings to be developed within the project will not leach chemical or other harmful substances that are non-biodegradable in the marine environment and will have no negative impact on the marine environment. In addition, the coatings will reduce the hydrodynamic resistance of ships and boats, decreasing fuel consumption and thus substantially reducing CO2 emissions. Finally, the new coatings will lead to considerable savings in operational costs by improving the efficiency of tidal power installations and reducing the frequency of maintenance and cleaning in off-shore infrastructure and aquaculture applications.

Project team

Five multinationals, seven SMEs and seven research institutes spread across eight EU Member States are working together to achieve the goals within the four-year timeframe. DPI is the project coordinator and International Paint Ltd., a business unit of AkzoNobel and a world leader in the field of fouling control coatings, will bring any new coatings based on technology developed within the project to the market. In focusing on the delivery of sustainable products and solutions, the goals of this project perfectly match the strategic ambitions of AkzoNobel. The project budget amounts to 11.2 million Euros including 8 million Euros from the European Commission.

Scope

In addition to the development of environmentally friendly coatings, SEAFRONT aims to significantly enhance fundamental understanding of fouling organisms and the mechanisms of settlement and adhesion. Particular attention is being paid to a better understanding of marine biofilm or so-called marine slime. This part of the research is being led by Professor Tony Clare of Newcastle University (UK), an internationally renowned marine biologist. The insights gained will enable SEAFRONT to develop concepts and technologies for enhanced performance, the ultimate goal being a completely non-fouling surface.

Current status

At the end of 2016 the project was well on track. A lot of work has been dedicated to the synthesis of new building blocks for next generation fouling control coatings and the development of new processes and methods to enhance fundamental understanding of the different phenomena involved.
The project results so far are promising and the collaborative atmosphere in the consortium is excellent. In their mid-term project review report the EU reviewers concluded that the project showed good progress and that most of the objectives and technical goals set for this period had been achieved.

2017, the last year of the project, will be devoted to completing the research on fouling related phenomena, dissemination and exploitation of the results. Also, in this last year, final field trials will start on the combination of the most promising technologies before commercialisation of novel fouling control coatings can start.

More information about this project can be found on the website:
www.seafront-project.eu

SEVENTH FRAMEWORK PROGRAMME

SHINE

The aim of the FP7 project SHINE (Self Healing Innovative Elastomers) was to develop self-healing elastomers for dynamic seals and vibration and noise abatement systems. The concept considered was based on covalent and non-covalent bonding, which can provide a repeatable healing response as a result of reversible reactivity.

Scope
SHINE investigated the healing mechanisms of both pure elastomers and elastomer-based composites. The methods for the design of these types of elastomers, tailor-made fillers and self-healing composites have been described in a systematic manner in relevant publications as well as in the final project report.

The project started on 1 February 2013 with a total budget of 6.4 M€, with a 4 M€ contribution from the EU. It ended on 31 July 2016 as planned.

Project results
The SHINE project team was successful in developing the planned self-healing elastomers, although the mechanical properties of the new elastomers were not (yet) comparable to those of conventional ones (with 60% recovery of the initial properties after healing).

Although repeatable self-healing elastomers (preventive versus curative healing) were developed, the stability in the repeatability of these elastomers was not (yet) at the level required for the targeted industrial application. If it proves possible to apply higher temperatures of operation for the typical applications, this will open up better options for various elastomers. In those applications, the results of the SHINE project will help to reduce the maintenance costs of infrastructures and machine parts.

New analytical tools as well as new analytical procedures were developed to better characterize and analyse self-healing elastomers and to be able to distinguish self-healing from gluing or retrogradation.

The project led to a good understanding of what is possible and what is not possible in relation to covalent and non-covalent bonding in elastomers as a means of achieving self-healing properties. No results were industrially applied or commercialized during or directly following the project.

Dissemination took place via 11 publications, presentations at 8 different conferences and poster presentations at 4 other conferences.

Collaboration
The fruitful collaboration within the SHINE consortium - which consisted of two universities, four research centres, five large companies and one SME - delivered interesting results. For the partners, who had not worked together before this project, the experience could be a stepping stone to collaborations in the future.

More information about this project can be found at:
https://cordis.europa.eu/project/rcn/106538/

EMMC-CSA

DPI is a partner in the project EMMC-CSA (European Materials Modelling Council - Coordination and Support Action), which comes under the EU's Horizon 2020 framework.

Modelling is a key pillar underpinning the development of new materials and products responding to societal needs and challenges and for ensuring competitiveness of European industry in the 21st century.

Scope
The aim of the project is to allow European Industry to reap the benefits of materials modelling more effectively and vigorously by helping to bridge the gap between academic innovation and industrial application.

The project, which was launched in September 2016 and has a duration of three years, is being carried out by a consortium of 15 partners from 10 countries and involves 5 companies and 10 Research and Technology Organizations (RTOs).

DPI's role
The tasks of DPI are related to the translation of industrial challenges into modelling solutions and the development of strategies for a wider adoption of materials modelling by industry.

DPI is also represented in the EMMC Operational Management Board.

More information about the European Materials modelling council EMMC and this project can be found at:
https://emmc.info/about-emmc-csa/

Co-funded by the Horizon 2020 programme
of the European Union

POLYOLEFINS

Polyolefins (PO) are the only class of synthetic macromolecules that can be produced catalytically with precise control of stereochemistry and, to a large extent, of (co) monomer sequence distribution. Therefore, as with the letters of the alphabet, the number of constituent elements which can be assembled into meaningfully organised structures is practically infinite and, accordingly, scope of application of polyolefins is continually growing.

OBJECTIVES

Polyolefin-based materials can be customised for a wide range of applications: from ultra-rigid thermoplastics to high-performance elastomers. This vast spectrum of performance is achieved by a variety of polyolefin molecular structures, whose common features are full atom economy in their synthesis, low cost, excellent properties, a long lifecycle and ease of recycling. The research programme of the Polyolefins programme area encompasses the entire spectrum of the knowledge chain, the aim being to increase proficiency in the ever-expanding applications. Although polyolefins represent one of the oldest (if not the oldest) thermoplastic polymer families, they are still very much characterised by continuous innovation. Both gradual and step change technology renewal yield new applications and reduce the manufacturing- and user eco-footprint. A specific example of this innovative capacity is the discovery of chain shuttling catalyst systems that enable the industrial production of polyolefin block (co)polymers with unprecedented structures, usable for a wide range of applications (from thermoplastic elastomers to optically active materials).

SUB-PROGRAMMES

Catalysis
Investigating, screening and developing (novel) homogeneous and heterogeneous catalyst systems, as well as new approaches for the immobilisation of molecular catalysts, new co-catalysts and activators.

Polymer structure, properties and processing
Understanding, modelling and predicting structure-processing property relationships in polyolefin-based polymer systems.

Polymer reactor engineering
Studying various reactor and technology unit operations to develop a quantitative description and acquire a thorough understanding of the crucial aspects of olefin polymerisation processes.

New methods and exploratory research
New polymerisation and polymer characterisation methods, high-throughput screening and experimentation, embryonic research and concept development.

POLYOLEFINS 2.0

The Polyolefins 2.0 programme kicked off early 2016 with the granting and start-up of two projects on topics selected by the industrial funding partners Borealis, Braskem, ExxonMobile, Reliance, SABIC, SCG Chemicals and Sinopec. In total 4 PhDs are working on these two projects at Eindhoven University of Technology, Lomonosov Moscow State University, University of Perugia and University of Naples Frederico II. A second Call for Proposals was launched in October 2016 for projects to be started in 2017.

FACTS AND FIGURES

Partners from industry
- Borealis
- Braskem
- Dow Benelux
- DSM
- ExxonMobil
- Lanxess Elastomers
- Michelin
- Reliance
- SABIC
- SCG Chemicals
- Sinopec
- Teijin Aramid

Partners from the research world
- Eindhoven University of Technology
- ESCPI-Lyon
- Fraunhofer Institute for Structural Durability and System Reliability LBF
- Johannnes Kepler University Linz
- Lomonosov Moscow State University
- Loughborough University
- Martin-Luther University of Halle-Wittenberg
- National Council for Scientific and Technological Development (CNPq)
- National University Consortium of Materials Science and Technology INSTM)
- Radboud University
- UFRGS Universidade Federal do Rio Grande do Sul
- Universidade Federal do Rio de Janeiro
- University of Manitoba
- University of Naples Federico II
- University of Perugia

Budget and organisation
Expenditure in 2016 totalled € 0.93 million. The total number of FTEs allocated at year-end 2016 was 11.6 (17 researchers). Prof.dr. Vincenzo Busico was Scientific Chairman and Dr. Jan Stamhuis was Programme Area Coordinator of the Polyolefins programme.

Publications and inventions
This programme area generated a total of twenty-one reviewed papers and four theses.

For details, see page 30

FUNCTIONAL POLYMER SYSTEMS

The Functional Polymer Systems (FPS) programme area performs research on polymers, small organic molecules and their prototype devices that are capable of an electrical, optical, magnetic, ionic or photo-responsive function and that offer potential for industrial application.

OBJECTIVES

The FPS research programme is structured along application lines in the following sub-programmes: polymer lighting and field-effect transistors; polymers for information and communication technology; solar cells (photovoltaics); and responsive materials, (bio)sensors and actuators.

SUB-PROGRAMMES

Polymers for information and communication technology

The objective of this sub-programme is to develop scalable techniques for structuring polymers on a nano- and micro-scale by combining 'top-down' approaches with 'bottom-up' techniques based on self-assembly or supramolecular chemistry in order to produce new or greatly enhanced properties for optical, electrical, biomedical and sensor applications. Research projects are focusing on IR-reflective windows, membranes with controlled pore-size and responsive surfaces making use of the available patterning tools.

Photovoltaics (PV)

This area is dedicated to exploring new materials and gaining a fundamental understanding of all (photo-) physical processes occurring in polymer and small organic molecule bulk heterojunction PV. Organic PV is one of many promising PV technologies offering the prospect of large area cost-effective PV for sustainable energy production in the long term. The research focuses on novel low-bandgap materials, hybrid (inorganic-organic) blends, stable materials under ambient conditions, non-radiative decay processes, efficient charge separation, morphology control, tandem solar cells and a thorough understanding of materials behaviour under operational device conditions.

Responsive materials and functional membranes

The purpose of the research is to develop new materials and processes that result in a change of shape and/or large displacement upon an external electrical, magnetic, optical and/or chemical trigger. Research projects focus on new piezo-electronic materials, membranes with controlled nano-pores, switchable surfaces and antireflective coatings.

FACTS AND FIGURES

Partners from industry

- BASF
- DSM
- SABIC

Partners from the research world

- Eindhoven University of Technology
- Imperial College London
- Max Planck Institute for Polymer Research
- University of Groningen
- University of Twente
- Wageningen University & Research

Budget and organisation

Expenditure in 2016 totalled € 0.43 million. The total number of FTEs allocated at year-end 2016 was 10.0 (11 researchers). Roland Korstanje was Programme Area Coordinator of the Functional Polymer Systems programme.

Publications and inventions

The research programme in this programme area generated a total of ten reviewed papers and one reported invention.

For details, see page 31

PERFORMANCE POLYMERS

Performance Polymers (PP) have considerable potential to contribute to reducing energy use, environmental impact and the effects of climate change through component consolidation, weight reduction, lifetime extension, recyclability and utilisation of renewable feedstock and create new opportunities for the construction, transport, appliances and electronics industries.

OBJECTIVES

This Performance Polymers (PP) programme area combines Engineering Polymers and Rubber Technologies and is positioned between bulk plastics and specialty polymers such as functional polymer systems. Performance polymers possess improved chemical, mechanical and/or physical properties, especially beyond ambient conditions. They are applied as material systems under (cyclic or continuous) load-bearing conditions and frequently consist of multi-component mixtures with various polymers, reinforcements and additives.

The performance requirements of complex parts and assemblies in polymer materials necessitate close technological cooperation between polymer supplier, converter and end user. That in turn calls for a thorough understanding of polymerisation and polymer modification, as well as the processing, properties and design of polymer systems. Moreover, the wide variety of base polymers in this programme area demands a special effort to identify commonality in those themes along the value chain. This is reflected in the strategy and objectives of the Performance Polymers programme area, which include investigation of fundamental issues in the value chain using a 'chain of knowledge' approach in terms of energy saving, durability, ultimate performance and sustainability.

PERFORMANCE POLYMERS 2.0

In September 2016 the first Call of the Performance Polymers 2.0 programme was issued on the topic of early detection of deformation, selected by the current industrial programme members Shell, Teijin Aramid, SABIC and AkzoNobel. Two projects were granted, one at the Eindhoven University of Technology and the other at the University of Manchester which is a new member of the DPI academic network.

FACTS AND FIGURES

Partners from industry

- AkzoNobel
- BASF
- Bayer
- DSM
- Food & Biobased Research Wageningen UR
- FrieslandCampina
- Petrobras
- SABIC
- SKF
- Teijin Aramid

Partners from the research world

- CNRS Strasbourg
- Delft University of Technology
- DWI an der RWTH Aachen
- Eindhoven University of Technology
- Food and Biobased Research, Wageningen UR
- Foundation for fundamental research on matter (FOM)
- National Council for Scientific and Technological Development (CNPq)
- National Technical University of Athens
- TI Food and Nutrition (TIFN)
- Tsinghua University
- Universidade Católica de Brasilia
- Universidade Federal do Rio de Janeiro
- University of Groningen
- University of Twente
- Wageningen University & Research

Budget and organisation

Expenditure in 2016 totalled € 1.43 million. The total number of FTEs allocated at year-end 2016 was 18.3 (29 researchers).Prof.dr. Costantino Creton was Scientific Chairman and Dr. Denka Hristova-Bogaerds was Programme Area Coordinator of the Performance Polymers programme.

Publications and inventions

The research programme in this programme area generated a total of twenty-eight reviewed papers and seven theses.

For details, see page 31

SUB-PROGRAMMES

Polymer and network chemistry and modification

Studies aimed at expanding the use of bio-based materials, by identifying their unique properties and reducing their eco-footprint. Further studies are designed to reduce the costs and energy use in polymerisation. Other objectives are network formation and the development of new concepts for monomer polymer molecular structure to achieve gradual changes in the balance of flow properties, static and dynamic mechanical behaviour and other functional properties.

Processing for properties, polymer physics and modelling

Understanding the relationship between the molecular structure, processing and properties of polymers. Studies of the processing effects of intermolecular interactions, e.g. hydrogen bonding. Processing, modification and vulcanisation studies of elastomer blends. Studies of complex flow behaviour, e.g. in particle reinforced visco-elastic materials.

Advanced reinforced thermoplastics and synthetic fibres

Studies of the interface effects in fibre-reinforced composite systems, the effects of nano-reinforcement on polymer material properties on macroscopic and microscopic scale with a focus on the effects at the matrix-filler interface, friction and wear studies of fibre-reinforced thermoplastics and elastomers.

Long term stability and performance

Investigation of the chemical and physical ageing mechanisms and their interaction, with the ultimate objective of predicting lifetime and attaining a fit-for-purpose design over the entire lifecycle. Studies of self-healing in polymeric materials as paradigm shift to realise improved fit-for purpose lifetimes.

Bio-Inspired Polymers

Development of advanced polymeric materials and methodologies inspired by natural polymeric structures and principles of natural systems such as self-assembly and biocatalysis, the main driver being sustainability. Bio-inspired polymers can be produced from renewable or fossil resources through either chemo catalysis or enzymatic/microbial catalysis. The structure-property relationships of the novel materials are studied to elucidate why they exhibit unique properties. One important line of research is intended to develop a generic toolbox for new bio-based polymers with a view to creating new business opportunities. Aspects addressed by a bio-based polymer programme include the identification of new or improved (multi-) functionalities of bio-based building blocks and polymers and the assessment of relevant technologies in the bio-based value chain.

COATINGS TECHNOLOGY

Within the Coatings Technology (CT) area frontier research in the general field of organic coatings is performed. The aim is to develop fundamental insights that will lead to innovative coatings technologies. The research is pre-competitive and is focussed at achieving sustainability, quality of life improvements, economic growth and preparing the coatings industry for future challenges.

OBJECTIVES

The research programme for Coatings Technology (CT) concentrates on exploring novel coating materials and technologies and acquiring fundamental insights into the structure-properties relationships of coatings to enable the coatings industry to meet future challenges. The research programme is based on three pillars: renewable raw materials and novel, environmentally friendly coating technologies; functional (smart) coatings; durability and testing of coatings.

SUB-PROGRAMMES

Renewable raw materials, formulation and powder coatings
There are currently three projects underway to study the feasibility of applying sustainable, renewable resources in coatings technology without compromising the properties of the final coating (film). The programme focuses on bio-based building blocks and raw materials as substitutes for materials derived from petrochemistry and their use in novel coating technologies. Systems being studied include polycarbonate powder coatings or waterborne polyurethane dispersions, as well as starch-based performance coating materials. The results are promising in that coatings have already been obtained which match and/or improve on the properties of purely synthetic coatings.

Functional (smart) coatings
'Smart coatings' are capable of responding to an external stimulus, such as light, temperature, pressure, pH, odours or gas. The stimulus causes a change in the coating's properties which may be permanent or reversible. Coatings with self-healing properties in response to mechanical damage or with light- or moisture-induced self-cleaning properties are of particular interest and have already been studied. Research on protective coatings that can adapt to their environment and/or conditions under which they are used is at the embryonic stage, but such systems, as well as tailored coatings for medical diagnostics (e.g. test strips) and implants, seem feasible in the future. The same applies for coatings with special optoelectronic and electronic properties that could be used in electronic devices and information technology.

Durability and testing of coatings
The aim is to gain a fundamental understanding of the degradation mechanisms of coatings used in outdoor exposure to enhance durability. Another objective of this sub-programme is to develop new testing methods for coatings, e.g. methods for testing adhesion, gloss or scratch resistance, which correlate to meaningful physical parameters. Last but not least, DPI collaborates intensively with the Materials Innovation Institute's 'Materials to Innovate' (M2i) programme in the study of anti-corrosion coatings.

FACTS AND FIGURES

Partners from industry
- AkzoNobel
- Altana
- DSM
- Lawter
- Saint-Gobain

Partners from the research world
- Changchun Institute of Applied Chemistry
- Eindhoven University of Technology
- University of Groningen
- Wageningen University & Research

Budget and organisation
Expenditure in 2016 totalled € 0.15 million. The total number of FTEs allocated at year-end 2016 was 3.7 (5 researchers). Dr. Monique Bruining was Programme Area Coordinator of this programme area.

Publications and inventions
The research programme in this programme area generated a total of twelve reviewed papers and one thesis.

For details, see page 33

LARGE-AREA THIN-FILM ELECTRONICS

Large-Area Thin-Film Electronics (LATFE) is the step in the value chain devoted to studying fundamental issues related to processing for large-area deposition and disruptive architectures for large-area organic electronic devices. Large-Area Thin-Film Electronics is an excellent example of a highly interdisciplinary research area, extending from chemistry and physics to engineering.

OBJECTIVES

Whereas Functional Polymers and Surfaces (FP&S) focuses on materials development and initial device performance, Large-Area Thin-Film Electronics (LATFE) is the obvious next step in the value chain. The fundamental knowledge generated should facilitate the reliable production and operation of organic electronic devices.

SUB-PROGRAMMES

Large-area material deposition using solution processing
The objective is to study fundamental issues of large-area polymer and small-molecule material deposition using roll-to-roll solution processing (gravure, flexo, screen, slot-die) to make the transition from lab scale to industrial scale for reliably processed devices. For patterning of structures inkjet printing is explored. Although lab-scale devices have superb performance, we lack the industrial processes and the fundamental knowledge about large-area material deposition from solution and patterning needed to choose the right deposition method per layer for mass production.

Disruptive device architectures
The purpose of this research is to develop disruptive device architectures for more reliable and easier production and to understand the failure mechanisms occurring in industrially produced devices. Current device architectures require very thin films (~ 100 nm) with less than 2% thickness deviation, which imposes very strict demands on the processing and production of devices. At the moment, this results in poor yields, high costs and many uncomprehended failures. There is an urgent need for new device architectures that allow more robust processing and production and improve yield without affecting device performance (efficacy, homogeneity of light output).

FACTS AND FIGURES

Partner from industry
- DSM

Partners from the research world
- Eindhoven University of Technology
- Max Planck Institute for Polymer Research
- University of Groningen
- University of Twente

Budget and organisation
Expenditure in 2016 totalled € 0.08 million. The total number of FTEs allocated at year-end 2016 was 3.7 (7 researchers). Ronald Korstanje was Programme Area Coordinator of this programme area.

Publications and inventions
This programme area generated a total of seventeen reviewed papers, eight theses and one reported invention.

For details, see page 34

POLYMERS FOR OIL AND GAS

In the Polymers for Oil and Gas research programme two main areas are distinguised: firstly, the use of polymers in fluids for enhanced oil recovery (EOR) and other subsurface drilling/recovery applications. With the increasing complexity of oil recovery from existing and new reservoirs, EOR could contribute significantly to more efficient recovery of the world's energy resources. The second area addresses the behaviour of polymers in materials used under extreme/adverse conditions, e.g. in hydrocarbon transport and in deep-sea and/or pre-salt applications. This topic is researched in close collaboration with the Performance Polymers programme area.

OBJECTIVES

The aim of the Polymers for Oil and Gas programme is to generate tools and new insights into existing and new polymers for utilisation in the exploration, production and transport of oil and gas.

SUB-PROGRAMMES

Structure–property relationships and the design of new model macromolecules
Controlled radical polymerisation techniques will be employed to investigate the effects of macromolecular topology, for example branching, on polymer solution properties and on viscosity and/or visco-elasticity. These novel structures are evaluated in core flow experiments to determine their injectivity and impact on the recovery of oil in porous media. The effects of polymeric surfactants, i.e. high molecular weight amphiphilic structures that have the potential to decrease the interfacial tension and enhance oil recovery compared with that obtained with the current polymer flooding applications, are also being investigated.

Relating polymer rheology to apparent viscosity in porous media
The objective of this sub-programme is to develop reliable models to predict the relationship of polymer-apparent viscosity in porous media to porous-medium properties, bulk rheological parameters and superficial velocity in the medium and establish the relationship with enhanced oil recovery.

FACTS AND FIGURES

Partners from industry
- Shell
- SNF Floerger

Partners from the research world
- Delft University of Technology
- University of Groningen

Budget and organisation
Expenditure in 2016 totalled € 0.10 million. The total number of FTEs allocated at year-end 2016 was 1.9 (2 researchers). Dr. Jan Stamhuis was Programme Area Coordinator of the Polymers for Oil and Gas programme.

Publications and inventions
This programme area generated no reviewed papers in 2016.

For details see page 34

Output 2016

POLYOLEFINS

Projects

#750: Optimisation and Calibration of High-Temperature Liquid Chromatographic Separation of Polypropylene and Propylene based Copolymers

#751: Predictive Modelling of Polyolefin Reactors

#753: Impact of the geometric parameters of catalyst supports on the kinetics and morphology of polyolefins

#754: Direct insight into elusive active Ti species of high-yield Ziegler-Natta Catalysts

#754ft16: Computaional Modeling of Ziegler-Natta Propene Polymerization Catalysts: Chemical Reactivity

#757: Influence of entanglement on rheological response of Ultra High Molecular Weight Polyethylene from linear to nonlinear viscoelastic behaviour

#785: High Impact Polypropylene: Structure Evolution and impact on Reaction

#787: In situ X-ray measurements

#791: A comprehensive integrated HTC&HTE workflow for the mechanistic study of (novel) olefin polymerization catalysts

#793: Novel Quadrupolar Nuclear Magnetic Resonance Methodology for the Study of MgCl2-Supported Ziegler-Natta Catalysts

#800: Quantitative Structure-Activity Relationships (QSAR) in Metallocene-Based Olefin Polymerization Catalysis

#801: Predictive modelling of mechanical anisotropy in oriented semi-crystalline polymers directly from morphological characteristics

#907: Gas Phase Propylene (Pre) Polymerisation: Impact of catalyst activation, prepolymerisation and support morphology on polypropylene production

Theses

Harmen Zijlstra
Mysterious MAO

Sampat Singh Bhati
Optimization and calibration of high-temperature liquid chromatographic separation of polypropylene and propylene based copolymers

Muhammad Ahsan Bashir
Impact of Physical Properties of Silica Supported Metallocenes on their Ethylene Polymerisation Kinetics and Polyethylene Properties

Ele de Boer
Implications of a tailored non-equilibrium polymer melt state on the viscoelastic response and crystallisation behaviour of UHMWPE

Scientific publications

M. A. Bashir, T. Vancompernolle, R. M. Gauvin, L. Delevoye, N. Merle, V. Monteil, M. Taoufik, T. F. L. McKenna and C. Boisson
Silica/mao/(n-bucp)(2)zrcl2 catalyst: Effect of support dehydroxylation temperature on the grafting of mao and ethylene polymerization
Catalysis Science & Technology 6(9) 2962-2974

Z. Li, M. V. Annaland, J. A. M. Kuipers and N. G. Deen
Effect of superficial gas velocity on the particle temperature distribution in a fluidized bed with heat production
Chemical Engineering Science 140(279-290

N. Yaghini and P. D. Iedema
Three-dimensional chain-length-branching-combination points distribution modeling of low density polyethylene in a continuous stirred tank reactor allowing for gelation
Chemical Engineering Science 140(348-358

T. Kolkman, M. V. Annaland and J. A. M. Kuipers
Development of a non-invasive optical technique to study liquid evaporation in gas-solid fluidized beds
Chemical Engineering Science 155(277-293

C. Boulho, H. S. Zijlstra, A. Hofmann, P. H. M. Budzelaar and S. Harder
Insight into oxide-bridged heterobimetallic al/zr olefin polymerization catalysts
Chemistry-a European Journal 22(48) 17450-17459

E. M. Troisi, M. van Drongelen, H. J. M. Caelers, G. Portale and G. W. M. Peters
Structure evolution during film blowing: An experimental study using in-situ small angle x-ray scattering
European Polymer Journal 74(190-208

G. Portale, D. Hermida-Merino and W. Bras
Polymer research and synchrotron radiation perspectives
European Polymer Journal 81(415-432

E. M. Troisi, S. Formenti, F. Briatico-Vangosa, D. Cavallo and G. W. M. Peters
Nucleation induced by "short-term pressurization" of an undercooled isotactic polypropylene melt
European Polymer Journal 85(553-563

S. S. Bhati, T. Macko and R. Brull
Estimation of critical conditions of polymers based on monitoring the polymer recovery
Journal of Chromatography A 1451(91-96

A. J. Ryan, W. Bras, D. Hermida-Merino and D. Cavallo
The interaction between fundamental and industrial research and experimental developments in the field of polymer crystallization
Journal of Non-Crystalline Solids 451(168-178

E. S. Blaakmeer, G. Antinucci, V. Busico, E. R. H. van Eck and A. P. M. Kentgens
Solid-state nmr investigations of mgcl2 catalyst support
Journal of Physical Chemistry C 120(11) 6063-6074

A. J. Cancelas, V. Monteil and T. F. L. McKenna
Influence of activation conditions on the gas phase polymerisation of propylene
Macromolecular Symposia 360(1) 133-141

M. A. Bashir, V. Monteil, C. Boisson and T. F. L. McKenna
Silica/methylaluminoxane/(n-bucp)(2)zrcl2: Effect of silica dehydroxylation temperature on hdpe morphology
Macromolecular Symposia 360(1) 61-68

A. J. Cancelas, G. Hongmanee, F. N. Andrade, M. Terano, T. Taniike and T. F. L. McKenna
A comparison of the influence of temperature

during slurry and gas phase propylene polymerization on ziegler-natta catalyst
Macromolecular Symposia 370(1) 41-51

L. Balzano, Z. Ma, D. Cavallo, T. B. van Erp, L. Fernandez-Ballester and G. W. M. Peters
Molecular aspects of the formation of shish-kebab in isotactic polypropylene
Macromolecules 49(10) 3799-3809

K. S. Liu, E. L. de Boer, Y. F. Yao, D. Romano, S. Ronca and S. Rastogi
Heterogeneous Distribution of Entanglements in a Nonequilibrium Polymer Melt of UHMWPE: Influence on Crystallization without and with Graphene Oxide
Macromolecules 49(19) 7497-7509

F. F. Karbach, T. Macko and R. Duchateau
Preparation of Ethylene/1-Hexene Copolymers from Ethylene Using a Fully Silica-Supported Tandem Catalyst System
Macromolecules 49(4) 1229-1241

G. Talarico and P. H. M. Budzelaar
Alpha-agostic interactions and growing chain orientation for olefin polymerization catalysts
Organometallics 35(1) 47-54

L. Rocchigiani, V. Busico, A. Pastore and A. Macchioni
Comparative nmr study on the reactions of hf(iv) organometallic complexes with al/zn alkyls
Organometallics 35(9) 1241-1250

K. S. Liu, E. Andablo-Reyes, N. Patil, D. H. Merino, S. Ronca and S. Rastogi
Influence of reduced graphene oxide on the rheological response and chain orientation on shear deformation of high density polyethylene
Polymer 87(8-16

S. H. Jeong, J. M. Kim, J. Yoon, C. Tzoumanekas, M. Kroger and C. Baig
Influence of molecular architecture on the entanglement network: Topological analysis of linear, long- and short-chain branched polyethylene melts via monte carlo simulations
Soft Matter 12(16) 3770-3786

FUNCTIONAL POLYMER SYSTEMS

Projects

#762: Solution-Processed Small-Molecule Tandem OPV

#763: Design of novel donor-acceptor systems with optimized morphology and transport

#764: Responsive IR reflectors based on polymeric cholesteric liquid crystals

#766: Responsive and self-healing membranes with well-defined nanopores using block copolymers

#767: Towards solution processable near-IR and IR-reflective coatings and mirrors with high transparency in the UV-visible regime

#775: Switchable topologies using responsive polymers for controlled wetting and self cleaning surfaces

#776: Membranes with adjustable interior in their nanopores

#777: Tuning the optical properties of thin film coatings by using self-assembled protein particles

#792: Particle Stability and Mobility in Silicones

Scientific publications

A. J. Liu, C. H. H. Traulsen and J. J. L. M. Cornelissen
Nitroarene Reduction by a Virus Protein Cage Based Nanoreactor
Acs Catalysis 6(5) 3084-3091

S. Solak, P. W. M. Blom and G. A. H. Wetzelaer
Effect of non-ohmic contacts on the light-intensity dependence of the open-circuit voltage in organic solar cells
Applied Physics Letters 109(5)

H. Khandelwal, G. H. Timmermans, M. G. Debije and A. P. H. J. Schenning
Dual electrically and thermally responsive broadband reflectors based on polymer network stabilized chiral nematic liquid crystals: The role of crosslink density
Chemical Communications 52(66) 10109-10112

L. L. Yang, A. J. Liu, S. Q. Cao, R. M. Putri, P. Jonkheijm and J. J. L. M. Cornelissen
Self-Assembly of Proteins: Towards Supramolecular Materials
Chemistry-a European Journal 22(44) 15570-15582

H. Khandelwal, M. G. Debije, T. J. White and A. P. H. J. Schenning
Electrically tunable infrared reflector with adjustable bandwidth broadening up to 1100 nm
Journal of Materials Chemistry A 4(16) 6064-6069

A. J. Liu, M. Verwegen, M. V. de Ruiter, S. J. Maassen, C. H. H. Traulsen and J. J. L. M. Cornelissen
Protein Cages as Containers for Gold Nanoparticles
Journal of Physical Chemistry B 120(26) 6352-6357

M. Garcia-Iglesias, B. F. M. de Waal, A. V. Gorbunov, A. R. A. Palmans, M. Kemerink and E. W. Meijer
A Versatile Method for the Preparation of Ferroelectric Supramolecular Materials via Radical End-Functionalization of Vinylidene Fluoride Oligomers
Journal of the American Chemical Society 138(19) 6217-6223

M. Cetintas and M. Kamperman
Self-assembly of PS-b-PNIPAM-b-PS block copolymer thin films via selective solvent annealing
Polymer 107(387-397

Y. F. Xu, H. P. C. van Kuringen, D. J. Mulder, A. P. H. J. Schenning and N. A. J. M. Sommerdijk
Smectic liquid crystal polymers as a template for ultrathin caco3 nanolayers
Rsc Advances 6(17) 13953-13956

K. Kumar, A. P. H. J. Schenning, D. J. Broer and D. Q. Liu
Regulating the modulus of a chiral liquid crystal polymer network by light
Soft Matter 12(13) 3196-3201

Reported invention

#775: E. de Jong, L. Liu, P.R. Onck, D.J. Broer
Switchable topologies using responsive polymers for controlled wetting and self-cleaning surfaces

PERFORMANCE POLYMERS

Projects

#718: High Tg Liquid Crystal Thermosetting Resins: A New Generation High-performance Polymers for Advanced Composites

#738: Tailored water-based materials assembled from sponge-like building blocks

#740: Enzymatic catalysis for the production of biobased monomers and polymers based upon them

#742: Membranes with Adjustable Interior in their Nanopores

#743: Curable Semi-aromatic or aliphatic Semi-crystalline Thermoplastics

#744: Molecular Simulations of Polymer Networks: Stress-Strain Relations, Cavitation, and Dynamics in Confinement

#745: Microstructure-based Modeling of the Intrinsic Kinectics of Aging and Deformation of Polymer Glasses

#746: Particles at Fluid-Fluid Interfaces

#749: The chemistry of rubber modification and crosslinking:New approaches towards an old problem

#756: Do contacts in electrically conductive particulate composites really exist?

#782: How short-cut fibers influence friction, wear and noise generation of polymers

#783: COntact mechaNics, FrictIon and coNtact fatiguE on polymeric SURFACES

#784: Reactive Polymer Colloids for Design of Interfaces in Fiber/matrix Composite Materials

#786: Processing for Enhanced Product Performance

#788: Predicting the Fountain Flow Instability from Material Properties and Processing conditions

#796: REFINE

Theses

Yi Jiang
Enzymatic Polymerization of Biobased Polyesters and Polyamides

Huub van Kuringen
Nanoporous polymer adsorbents based on smeltic liquid crystals

Nick Jaensson
Modeling interfaces and particles in viscoelastic fluids

Yongliang Zhao
Silica-Based Inorganic/Organic Hybrid Materials

Oana Andreea Bârsan
Towards polymer composites with ultimate conductivity

Liliana Gustini
Sorbitol-derived polyesters: a renewable platform towards sustainable materials
Ye Wang
Out-of-Cleanroom Magnetic Artificial Cilia

Scientific publications

C. von der Ehe, T. Bus, C. Weber, S. Stumpf, P. Bellstedt, M. Hartlieb, U. S. Schubert and M. Gottschaldt
Glycopolymer-functionalized cryogels as catch and release devices for the pre-enrichment of pathogens
Acs Macro Letters 5(3) 326-331

L. Gustini, L. Finzel, C. Lavilla, B. A. J. Noordover, M. M. R. M. Hendrix, C. Gehrels and C. E. Koning
Understanding the limitations of the solvent-free enzymatic synthesis of sorbitol-containing polyesters
Acs Sustainable Chemistry & Engineering 4(4) 2259-2268

C. L. Li, R. J. Sablong and C. E. Koning
Chemoselective Alternating *Copolymerization of Limonene Dioxide and Carbon Dioxide: A New Highly Functional Aliphatic Epoxy Polycarbonate*
Angewandte Chemie-International Edition 55(38) 11572-11576

L. Gustini, C. Lavilla, A. M. de Ilarduya, S. Munoz-Guerra and C. E. Koning
Isohexide and sorbitol-derived, enzymatically synthesized renewable polyesters with enhanced t-g
Biomacromolecules 17(10) 3404-3416

Y. M. Ma, D. X. Wei, H. Yao, L. P. Wu and G. Q. Chen
Synthesis, Characterization and Application of Thermoresponsive Polyhydroxyalkanoate-graft-Poly(N-isopropylacrylamide
Biomacromolecules 17(8) 2680-2690

L. Gustini, C. Lavilla, W. W. T. J. Janssen, A. M. de Ilarduya, S. Munoz-Guerra and C. E. Koning
Green and selective polycondensation methods toward linear sorbitol-based polyesters: Enzymatic versus organic and metal-based catalysis
Chemsuschem 9(16) 2250-2260

W. M. Pazin, D. S. Olivier, N. Vilanova, A. P. Ramos, I. K. Voets, A. E. E.Soares, A. M. Ito
Interaction of Artepillin C with model membranes
European Biophysics Journal 46(4) 383-393

L. M. Polgar, G. Fortunato, R. Araya-Hermosilla, M. van Duin, A. Pucci and F. Picchioni
Cross-linking of rubber in the presence of multi-functional cross-linking aids via thermoreversible diels-alder chemistry
European Polymer Journal 82(208-219

C. L. Li, S. van Berkel, R. J. Sablong and C. E. Koning
Post-functionalization of fully biobased poly(limonene carbonate)s: Synthesis, characterization and coating evaluation
European Polymer Journal 85(466-477

T. T. H. Pham, F. Snijkers, I. M. Storm, F. A. de Wolf, M. A. C. Stuart and J. van der Gucht
Physical and mechanical properties of thermosensitive xanthan/collagen-inspired protein composite hydrogels
International Journal of Polymeric Materials and Polymeric Biomaterials 65(3) 125-133

M. Semkiv and M. Hutter
Modeling Aging and Mechanical Rejuvenation of Amorphous Solids
Journal of Non-Equilibrium Thermodynamics 41(2) 79-88

N. O. Jaensson, M. A. Hulsen and P. D. Anderson
Direct numerical simulation of particle alignment in viscoelastic fluid
Journal of Non-Newtonian Fluid Mechanics 235(125-142

W. Ogieglo, Z. P. Madzarevic, M. J. T. Raaijmakers, T. J. Dingemans and N. E. Benes
High-pressure sorption of carbon dioxide and methane in all-aromatic poly(etherimide)-based membranes
Journal of Polymer Science Part B-Polymer Physics 54(10) 986-993

L. M. Polgar, M. van Duin and F. Picchioni
The preparation and properties of thermo-reversibly cross-linked rubber via diels-alder chemistry
Jove-Journal of Visualized Experiments 114)

Y. Wang, J. den Toonder, R. Cardinaels and P. Anderson
A continuous roll-pulling approach for the fabrication of magnetic artificial cilia with microfluidic pumping capability
Lab on a Chip 16(12) 2277-2286

C. von der Ehe, A. Rinkenauer, C. Weber, D. Szamosvari, M. Gottschaldt and U. S. Schubert
Selective uptake of a fructose glycopolymer prepared by raft polymerization into human breast cancer cells
Macromolecular Bioscience 16(4) 508-521

Y. S. Deshmukh, C. H. R. M. Wilsens, R. Verhoef, M. R. Hansen, D. Dudenko, R. Graf, E. A. Klop and S. Rastogi
Conformational and structural changes with increasing methylene segment length in aromatic-aliphatic polyamides
Macromolecules 49(3) 950-962

M. Koole, R. Frisenda, M. L. Petrus, M. L. Perrin, H. S. J. van der Zant and T. J. Dingemans
Charge transport through conjugated azomethine-based single molecules for optoelectronic applications
Organic Electronics 34(38-41

M. Al Samman and W. Radke
Two-dimensional chromatographic separation of branched polyesters according to degree of branching and molar mass
Polymer 99(734-740

H. P. C. van Kuringen, D. J. Mulder, E. Beltran, D. J. Broer and A. P. H. J. Schenning
Nanoporous polymer particles made by suspension polymerization: Spontaneous symmetry breaking in hydrogen bonded

smectic liquid crystalline droplets and high adsorption characteristics
Polymer Chemistry 7(29) 4712-4716

H. Yao, D. X. Wei, X. M. Che, L. W. Cai, L. Tao, L. Liu, L. P. Wu and G. Q. Chen
Comb-like temperature-responsive polyhydroxyalkanoate-graft-poly(2-dimethylamino-ethylmethacrylate) for controllable protein adsorption
Polymer Chemistry 7(38) 5957-5965

L. Gustini, C. Lavilla, L. Finzel, B. A. J. Noordover, M. M. R. M. Hendrix and C. E. Koning
Sustainable coatings from bio-based, enzymatically synthesized polyesters with enhanced functionalities
Polymer Chemistry 7(43) 6586-6597

P. Gijsman, W. F. Dong, A. Quintana and M. Celina
Influence of temperature and stabilization on oxygen diffusion limited oxidation profiles of polyamide 6
Polymer Degradation and Stability 130(83-96

Y. Jiang and K. Loos
Enzymatic synthesis of biobased polyesters and polyamides
Polymers 8(7)

C. von der Ehe, C. Weber, M. Gottschaldt and U. S. Schubert
Immobilized glycopolymers: Synthesis, methods and applications
Progress in Polymer Science 57(64-102;

L. M. Polgar, R. R. J. Cerpentier, G. H. Vermeij, F. Picchioni and M. van Duin
Influence of the chemical structure of cross-linking agents on properties of thermally reversible networks
Pure and Applied Chemistry 88(12) 1103-1116

Y. Jiang, D. Maniar, A. J. J. Woortman and K. Loos
Enzymatic synthesis of 2,5-furandicarboxylic acid-based semi-aromatic polyamides: Enzymatic polymerization kinetics, effect of diamine chain length and thermal properties
Rsc Advances 6(72) 67941-67953

M. Khafidh, N. V. Rodriguez, M. A. Masen and D. J. Schipper
The dynamic contact area of elastomers at different velocities
Tribology-Materials Surfaces & Interfaces 10(2) 70-73

COATINGS TECHNOLOGY

Projects

#758: Self-replenishing hydrophobic coatings with intrinsic hardness cured by LED's

#759: Novel Isocyanate-free, Chain-Extended Polyurethane Dispersions Containing Alternative Internal Dispersing Agents

#780: Self-replenishing high-surface-energy coatings

#781: Film Formation in Complex Colloidal Coatings

Thesis

Yujing Zhang
Self-replenishing photo-cured hydrophobic dual-network coatings

Scientific publications

S. Ma, C. Liu, R. J. Sablong, B. A. J. Noordover, E. J. M. Hensen, R. A. T. M. van Benthem and C. E. Koning
Catalysts for Isocyanate-Free Polyurea Synthesis: Mechanism and Application
Acs Catalysis 6(10) 6883-6891

H. Makki, K. N. S. Adema, E. A. J. F. Peters, J. Laven, L. G. J. van der Ven, R. A. T. M. van Benthem and G. de With
Degradation of a polyester-urethane coating: Physical properties
Journal of Polymer Science Part B-Polymer Physics 54(6) 659-671

C. Rocco, F. Karasu, C. Croutxe-Barghorn, X. Allonas, M. Lecompere, G. Riess, Y. Zhang, A. C. C. Esteves, L. G. J. van der Ven, R. A. T. M. van Benthem and G. de With
Highly-interpenetrated and phase-separated UV-cured interpenetrating methacrylate-epoxide polymer networks: Influence of the composition on properties and microstructure
Materials Today Communications 6(17-27

G. Kacar and G. de With
Hydrogen bonding in dpd: Application to low molecular weight alcohol-water mixtures
Physical Chemistry Chemical Physics 18(14) 9554-9560

Y. Zhang, F. Karasu, C. Rocco, L. van der Ven, R. A. T. M. van Benthem, X. Allonas, C. Croutxe-Barghorn, A. C. C. Esteves and G. de With
Pdms-based self-replenishing coatings
Polymer 107(249-262

H. Makki, K. N. S. Adema, E. A. J. F. Peters, J. Laven, L. G. J. van der Ven, R. A. T. M. van Benthem and G. de With
Multi-scale simulation of degradation of polymer coatings: Thermo-mechanical simulations
Polymer Degradation and Stability 123(1-12

K. N. S. Adema, H. Makki, E. A. J. F. Peters, J. Laven, L. G. J. van der Ven, R. A. T. M. van Benthem and G. de With
The influence of the exposure conditions on the simulated photodegradation process of polyester-urethane coatings
Polymer Degradation and Stability 123(121-130

K. N. S. Adema, H. Makki, E. A. J. F. Peters, J. Laven, L. G. J. van der Ven, R. A. T. M. van Benthem and G. de With
The influence of the exposure conditions on the chemical and physical changes of polyester-urethane coatings during photodegradation
Polymer Degradation and Stability 123(13-25

F. Karasu, C. Rocco, Y. Zhang, C. Croutxe-Barghorn, X. Allonas, L. G. J. van der Ven, R. A. T. M. van Benthem, A. C. C. Esteves and G. de With
Led-cured self-replenishing hydrophobic coatings based on interpenetrating polymer networks (ipns)
Rsc Advances 6(40) 33971-33982

H. M. van der Kooij, R. Fokkink, J. van der Gucht and J. Sprakel
Quantitative imaging of heterogeneous dynamics in drying and aging paint
Scientific Reports 6(

H. M. van der Kooij, G. T. van de Kerkhof and J. Sprakel
A mechanistic view of drying suspension droplets
Soft Matter 12(11) 2858-2867

Y. W. Li and Z. Y. Sun
The relationship between local density and bond-orientational order during crystallization of the gaussian core model
Soft Matter 12(7) 2009-2016

LARGE-AREA THIN FILM ELECTRONICS

Projects

#734: Predictive processing of polymer: fullerene solar cells

#741: Inkjet Printing of Suspensions

#748: Organic semiconductors blended into a crosslinkable insulator: Separating processability from optoelectronic functionality

#752: Looking down the rabbit hole: impact of porosity in the (in)organic layers on the perfomance of moisture permeation multilayer barriers

Theses

Davood Abbaszadeh
Reduction of Loss Processes in Polymer Light-Emitting Diodes

Monique Bötzer
Methanol- und wasserlösliche Polyfluoren-Copolymere

Daniel Lenkeit
Neuartige Fluoren-Copolymere für aus Lösung prozessierbare Mehrschicht-Bauelemente

Davide Bartesaghi
Device physics of polymer:fullerene bulk heterojunction solar cells

Hans van Franeker
Droplets, fibers & crystals: controlling the nanostructure of polymer and perovskite solar cells

Charley Schaefer
Theory of nanostructuring in solvent-deposited thin polymer films

Emanuele Breuza
Computational and Structural Study of Model and Industrial Ziegler-Natta Catalysts

Alberto Perrotta
Looking down the rabbit hole: nano-porosity in thin films

Scientific publications

A. Perrotta, W. M. M. Kessels and M. Creatore
Dynamic ellipsometric porosimetry investigation of permeation pathways in moisture barrier layers on polymers
Acs Applied Materials & Interfaces 8(38) 25005-25009

Y. H. Lin, S. R. Thomas, H. Faber, R. P. Li, M. A. McLachlan, P. A. Patsalas and T. D. Anthopoulos
Al-Doped ZnO Transistors Processed from Solution at 120 degrees C
Advanced Electronic Materials 2(6)

D. Abbaszadeh and P. W. M. Blom
Efficient blue polymer light-emitting diodes with electron-dominated transport due to trap dilution
Advanced Electronic Materials 2(7)

D. Bartesaghi, G. Ye, R. C. Chiechi and L. J. A. Koster
Compatibility of ptb7 and [70]pcbm as a key factor for the stability of ptb7:[70]pcbm solar cells
Advanced Energy Materials 6(13)

J. G. Labram, N. D. Treat, Y. H. Lin, C. H. Burgess, M. A. McLachlan and T. D. Anthopoulos
Energy quantization in solution-processed layers of indium oxide and their application in resonant tunneling diodes
Advanced Functional Materials 26(10) 1656-1663

N. D. Boscher, M. H. Wang, A. Perrotta, K. Heinze, M. Creatore and K. K. Gleason
Metal-Organic Covalent Network Chemical Vapor Deposition for Gas Separation
Advanced Materials 28(34) 7479-7485

G. H. L. Heintges, J. J. van Franeker, M. M. Wienk and R. A. J. Janssen
The effect of branching in a semiconducting polymer on the efficiency of organic photovoltaic cells
Chemical Communications 52(1) 92-95

D. Abbaszadeh, G. A. H. Wetzelaer, N. Y. Doumon and P. W. M. Blom
Efficient polymer light-emitting diode with air-stable aluminum cathode
Journal of Applied Physics 119(9)

Q. Wang, J. J. van Franeker, B. J. Bruijnaers, M. M. Wienk and R. A. J. Janssen
Structure-property relationships for bis-diketopyrrolopyrrole molecules in organic photovoltaics
Journal of Materials Chemistry A 4(27) 10532-10541

C. H. Duan, R. E. M. Willems, J. J. van Franeker, B. J. Bruijnaers, M. M. Wienk and R. A. J. Janssen
Effect of side chain length on the charge transport, morphology, and photovoltaic performance of conjugated polymers in bulk heterojunction solar cells
Journal of Materials Chemistry A 4(5) 1855-1866

S. Shao, Z. Chen, H. H. Fang, G. H. ten Brink, D. Bartesaghi, S. Adjokatse, L. J. A. Koster, B. J. Kooi, A. Facchetti and M. A. Loi
N-type polymers as electron extraction layers in hybrid perovskite solar cells with improved ambient stability
Journal of Materials Chemistry A 4(7) 2419-2426

A. Senes, S. C. J. Meskers, W. M. Dijkstra, J. J. van Franeker, S. Altazin, J. S. Wilson and R. A. J. Janssen
Transition dipole moment orientation in films of solution processed fluorescent oligomers: Investigating the influence of molecular anisotropy
Journal of Materials Chemistry C 4(26) 6302-6308

C. H. Duan, K. Gao, J. J. van Franeker, F. Liu, M. M. Wienk and R. A. J. Janssen
Toward practical useful polymers for highly efficient solar cells via a random copolymer approach
Journal of the American Chemical Society 138(34) 10782-10785

C. Schaefer, J. J. Michels and P. van der Schoot
Structuring of thin-film polymer mixtures upon solvent evaporation
Macromolecules 49(18) 6858-6870

D. Abbaszadeh, A. Kunz, G. A. H. Wetzelaer, J. J. Michels, N. I. Craciun, K. Koynov, I. Lieberwirth and P. W. M. Blom
Elimination of charge carrier trapping in diluted semiconductors
Nature Materials 15(6) 628-+

C. H. Duan, J. J. van Franeker, M. M. Wienk and R. A. J. Janssen
High open circuit voltage polymer solar cells enabled by employing thiazoles in semiconducting polymers
Polymer Chemistry 7(36) 5730-5738

D. Abbaszadeh, N. Y. Doumon, G. J. A. H. Wetzelaer, L. J. A. Koster and P. W. M. Blom
Effect of the layer thickness on the efficiency enhancement in bilayer polymer light-emitting diodes
Synthetic Metals 215(64-67

Reported invention

#734: C. Schaefer
Predictive processing of polymer: fullerene solar cells

POLYMERS FOR OIL AND GAS

Projects

#736: Relating Polymer Rheology to Apparent Viscosity in Poreus Media

#778: Strategies towards industrial production of new (branched) polyacrylamide structures for EOR

HIGH-THROUGHPUT EXPERIMENTATION

Scientific publication

J. Vitz, T. C. Majdanski, A. Meier, P. J. Lutz and U. S. Schubert
Polymerization of ethylene oxide under controlled monomer addition via a mass flow controller for tailor made polyethylene oxides
Polymer Chemistry 7(24) 4063-4071

EMERGING TECHNOLOGIES

Scientific publication

Q. B. Guan, B. Norder, L. Y. Chug, N. A. M. Besseling, S. J. Picken and T. J. Dingemans
All-Aromatic (AB)(n)-Multiblock Copolymers via Simple One-Step Melt Condensation Chemistry
Macromolecules 49(22) 8549-8562

EXCHANGE PROGRAMME BRAZIL

Projects

#769: High performance Stereocomplex of Poly(lactic acid) SC-PLA

#770: Antimicrobial recombinant polymers for treatment of nosocomial infections

#772: Emergent properties of biomolecular systems: structural/dynamic characterization and development of new functionalities

EXCHANGE PROGRAMME CHINA

Projects

#779: Preparation and Characterization of Model Waterborne Clearcoats

#794: Microbial Synthesis of Functional Polyhydroxyalkanoates (PHA)

NEWPOL (NEW POLYMER MATERIALS) PROGRAMME

Projects

#731.015.502: Responsive Commodity Polymers

#731.015.503: Supramolecular Biomaterials with a Dual Network Architecture for Stem Cell Expansion

#731.015.504: Self-Synthesizing Hydrogels

#731.015.506: Towards flexible memories with coordination polymers with polar rotors

DPI ...

DPI is a foundation funded by Dutch industry, universities and the government which was set up to perform exploratory research in the area of polymer materials.

DPI operates at the interface of universities and industry, linking the scientific skills of university research groups to the industrial need for innovation.

DPI carries out pre-competitive research projects to add value to the scientific community through scientific publications and to the industrial community through the creation of intellectual property.

DPI provides a unique platform for generating awareness of new technology, in which participating industrial companies, competitors in the market place, communicate on a pre-competitive basis to trigger innovation.

DPI integrates the scientific disciplines and know-how of universities into the ‘chain of knowledge’ needed to optimise the conditions for making breakthrough inventions and triggering industrial innovation.

DPI aims to combine scientific excellence with a genuinely innovative impact in industry, thereby creating a new mindset in both industrial and academic research.

DPI aims to fill the innovation gap between industry and universities and so resolve the Dutch Paradox of scientific excellence and lack of innovation.

Some 75 researchers (PhDs and Post-Docs) are currently involved in DPI projects at knowledge institutes throughout the world.

DPI
The Polymer
Research Platform

Mail address
P.O. Box 902
5600 AX Eindhoven
The Netherlands

Visiting address
Kennispoort
John F. Kennedylaan 2
5612 AB Eindhoven

T   +31 (0) 40 247 56 29
F   +31 (0) 40 247 24 62

info@polymers.nl
www.polymers.nl