DPI Annual Meeting

13 and 14 November 2018

Holiday Inn, Eindhoven, the Netherlands


ORIGINAL
VINTAGE


ORIGINAL


Welcome
to the
NEXT
LEVEL


Welcome
to the
NEXT
LEVEL


Welcome
to the
NEXT
LEVEL
DPI
The Polymer
Research Platform


DPI
2018: Highlights – 1
Scientific achievements and recognitions
Number of DPI Publications (2017): 70
Number of PhD Theses (2017): 10
GRACM PhD Award for DPI postdoc Georgios Vogiatzis
DPI to again co-organise Blue Sky Conference in 2019


DPI
Welcome
MIPRO


DPI
2018: Highlights – 1
Scientific achievements and recognitions
Number of DPI Publications (2017): 70
Number of PhD Theses (2017): 10
GRACM PhD Award for DPI postdoc Georgios Vogiatzis


Why polymer solar cells?


Project goal: Predictive processing of polymer:fullerene solar cells
BASF
TU/e
DPI Project "How2Blend4Function"

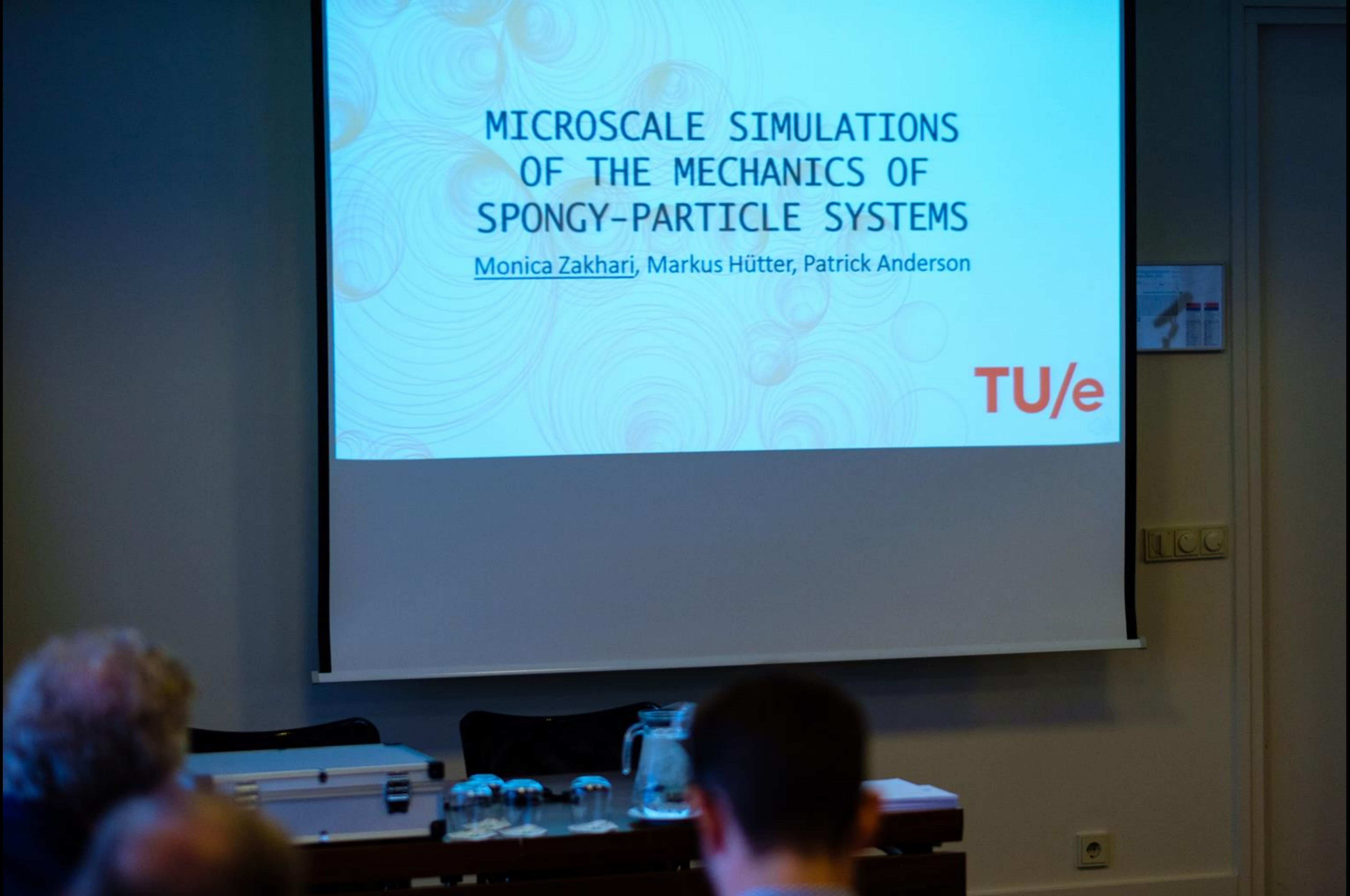

ergy Technology)
ment)
TU/e
DPI
iety
number of wafers per day


TU/e
EINDHOVEN UNIVERSITY OF TECHNOLOGY
Adjustable nanoporous polymers
Based on smectic liquid crystals
Dirk Jan Mulder
13 November
DPI Annual Meeting 2018


The Energy – Water Challenge
90%
POWER
WATER INTENSE
2.8
billion PEOPLE
HIGH WATER
SCARCITY
2035
50%
and 2.5 billion
PEOPLE have
UNRELIABLE or NO
Access to
ELECTRICITY
... increasing
WATER
CLIMATE


Nanoporous liquid crystal networks
3D
2D
1D


Proton conductivity


MICROSCALE SIMULATIONS
OF THE MECHANICS OF
SPONGY-PARTICLE SYSTEMS
Monica Zakhari, Markus Hütter, Patrick Anderson
TU/e


22
DPI


TU/e

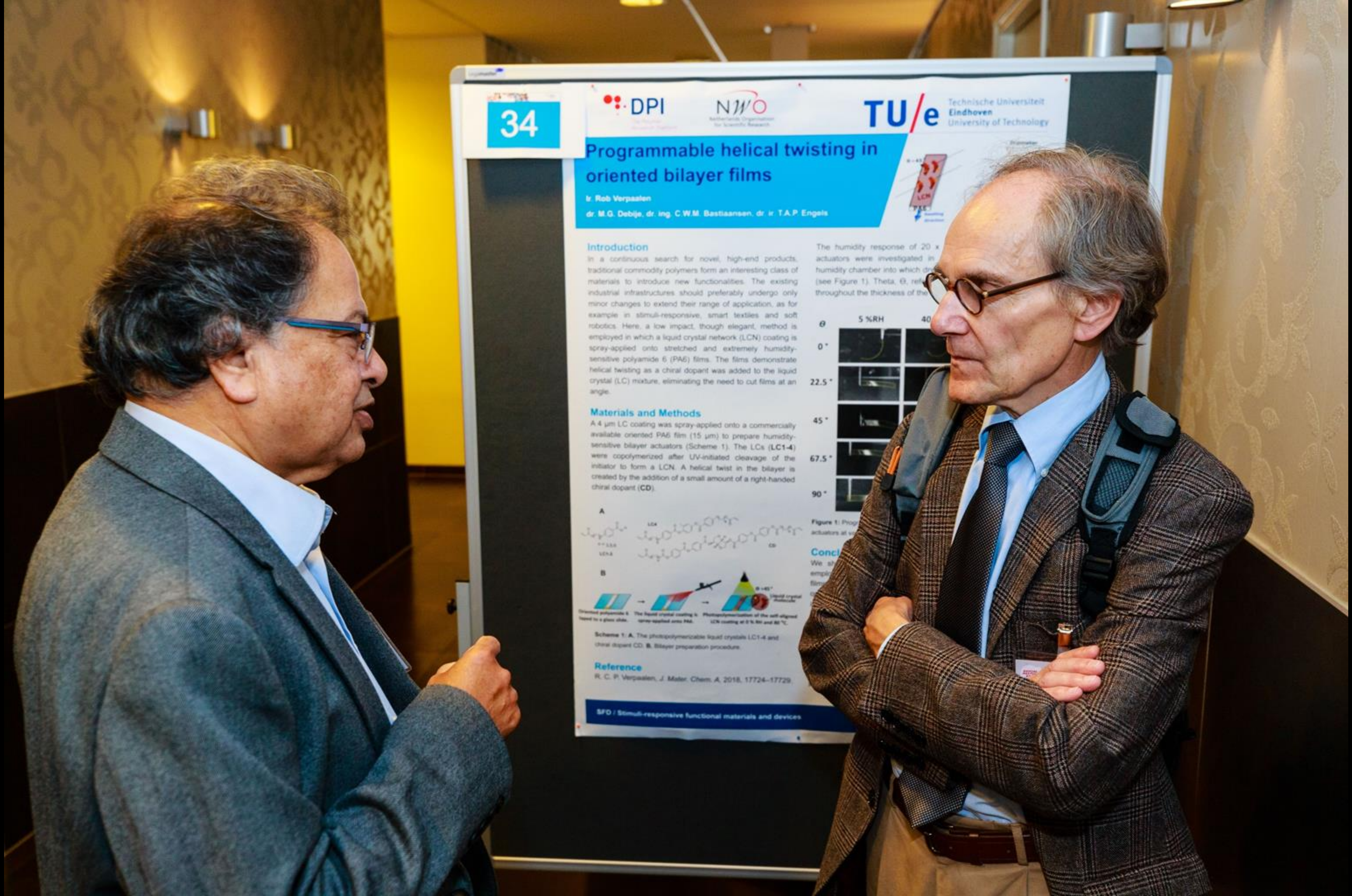

27


10
DPI


NEXT LEVEL
Research


DPI


31
Lifetime prediction of
DPI Safe-RIDE
Background
Research objectives


34
DPI
NWO
TU/e Technische Universiteit Eindhoven University of Technology
Programmable helical twisting in oriented bilayer films
Ir. Rob Verpaalen
dr. M.G. Debije, dr. ing. C.W.M. Bastiaansen, dr. ir. T.A.P. Engels
Introduction
In a continuous search for novel, high-end products, traditional commodity polymers form an interesting class of materials to introduce new functionalities. The existing industrial infrastructures should preferably undergo only minor changes to extend their range of application, as for example in stimuli-responsive, smart textiles and soft robotics. Here, a low impact, though elegant, method is employed in which a liquid crystal network (LCN) coating is spray-applied onto stretched and extremely humidity-sensitive polyamide 6 (PA6) films. The films demonstrate helical twisting as a chiral dopant was added to the liquid crystal (LC) mixture, eliminating the need to cut films at an angle.
Materials and Methods
A 4 µm LC coating was spray-applied onto a commercially available oriented PA6 film (15 µm) to prepare humidity-sensitive bilayer actuators (Scheme 1). The LCs (LC1-4) were copolymerized after UV-initiated cleavage of the initiator to form a LCN. A helical twist in the bilayer is created by the addition of a small amount of a right-handed chiral dopant (CD).
θ
5 %RH
0 °
22.5 °
45 °
67.5 °
90 °
Scheme 1: A. The photopolymerizable liquid crystals LC1-4 and chiral dopant CD. B. Bilayer preparation procedure.
Reference
R. C. P. Verpaalen, J. Mater. Chem. A, 2018, 17724–17729.
SFD / Stimuli-responsive functional materials and devices


35
HEMPR: Heat
Abstract
DPI


TU/e
DPI


2D Material Coatings for Fibres
Jingwen Chu, Prof. Robert J. Young, Dr. Mark A. Bissett
The University of Manchester
DPI
Objectives
Introduction
Sample Preparation
Results
Fibre coating
Fibres (Twaron, glass and carbon fibres)
Coating solution
Dip Coating
Dry at 100 °C for 24 h (fully remove NMP and cure the resin)
Future Work
8


DPI
Invited speakers
Dr. Søren Bøwadt (European Commission)
Dr. Just Jansz (Expertise Beyond Borders)
Prof. Kim Ragaert (University of Ghent)
Dr. Patricia Vangheluwe (PlasticsEurope)


ebb
Plastics in the circular economy
Industry needs to embrace the circular economy in the wake of growing public concern on plastic waste
Dr. Just Jansz
Expertise Beyond Borders BV
DPI Annual Meeting, Eindhoven
13 November 2018


ebb
Marine plastic litter: 8 countries in Asia account for 75% of plastic waste washed into the oceans
Holiday Inn


A lot of plastics is used only once


A lot of plastics is used only once
Used once
Discarded
(landfill /
Incineration /
energy recovery
Still in-use
Collected for recycling
Landfill
Incinerated
Global plastics production and use, 1950-2015


Welcome
to the
NEXT
LEVEL
DPI
The Polymer
Research Platform


Patricia Vanghelowe


Plastics 2030
Commitment for a Plastics
Circular
Dr. Patricia
Director
Affairs
PlasticsEurope
DPI Annual


Plastics 2030 –
for a Plastics
Circular Economy
Dr. Patricia Vangheluwe
Director Consumer &
DPI Annual Event
13 November 2018
PlasticsEurope


Welcome
to the
NEXT
LEVEL


FACULTY OF ENGINEERING
AND ARCHITECTURE
TO RECYCLE OR NOT TO RECYCLE
IT'S HARDLY A QUESTION
Prof. Kim Ragaert
Annual Meeting - Eindhoven, November 13th 2018


ASIC PRINCIPLES OF MECHANICAL RECYCLING
Compounding
Twin screw extrusion
Melt filtration
Adequate feeding, venting,..
Washing, sorting, shredding
(compounding)
Conversion to new product
solid plastic waste


BASIC PRINCIPLES OF MECHANICAL RECYCLING
Compounding
Twin screw extrusion
Melt filtration
Adequate feeding, venting,...
Washing, sorting, shredding
Conversion (as virgin)
Extrusion (cast or film)
thermoforming
Injection moulding
(compounding)
Conversion to new product
solid plastic waste
Holiday Inn


Materials Science & Polymer Engineering
are the key to improved and increased
mechanical recycling of polymers


DPI


Towards a Circular Economy
for Plastics
Søren Bøwadt
DG Research & Innovation
European Commission


The workhorse material of our current economy entails urgent environmental, social and economic drawbacks
Holiday Inn
Welcome


Welcome
to the
NEXT
LEVEL
DPI
The Polymer
Research Platfo


Welcome
to the
NEXT
LEVEL


Welcome
to the
NEXT
LEVEL
DPI
The Polymer
Research Platform


Welcome
to the
NEXT
LEVEL


Welcome to the
NEXT LEVEL
Golden Thesis Award
Dirk-Jan Mulder


Welcome to the
NEXT LEVEL
Golden Thesis Award
Dirk Jan Mulder
DPI


Welcome to the
NEXT LEVEL
Golden Thesis Award
Dirk Jan Mulder
DPI


Welcome
to the
NEXT
LEVEL


Welcome
to the
NEXT
LEVEL


Welcome
to the
NEXT
LEVEL
Thesis Award
Hans van Franeker


Welcome
to the
NEXT
DPI
Golden Thesis Award
Dirk Jan Mulder
Thesis Award

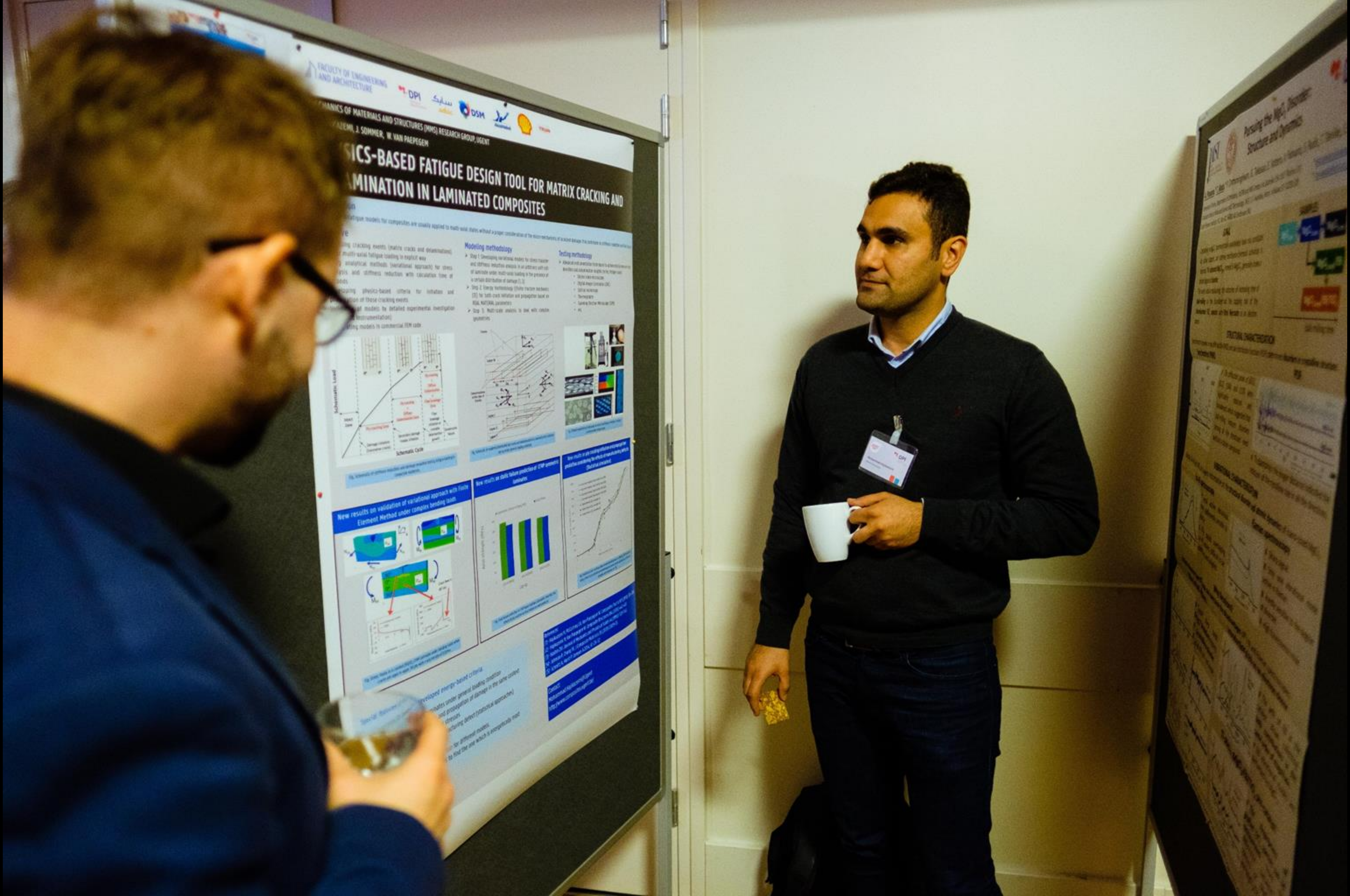

Welcome
to the
NEXT
Third Poster Prize
Annelore Aerts
DPI

Welcome
DPI
The Polymer Research Platform
First Poster Prize
Hanne van der Kooij
DPI


Welcome
to the
NEXT
DPI
First Poster Prize
Hanne van der Kooij
DPI
Second Poster Prize
Rob Verpaalen
DPI
Third Poster Prize
Annelore Aerts
DPI


Second Poster Prize
Rob Verpaalen
DPI


NEXT
LEVEL
Development

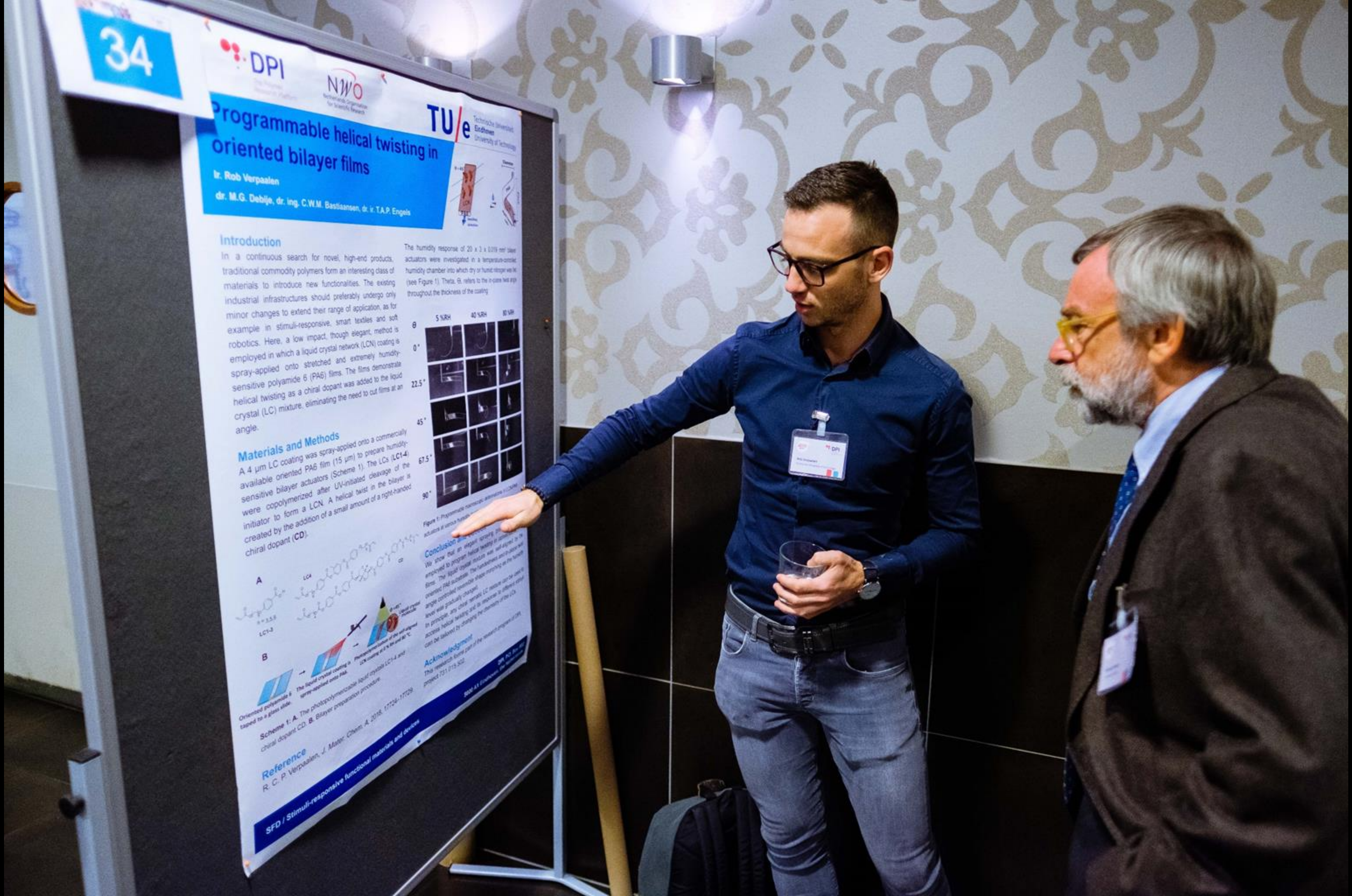


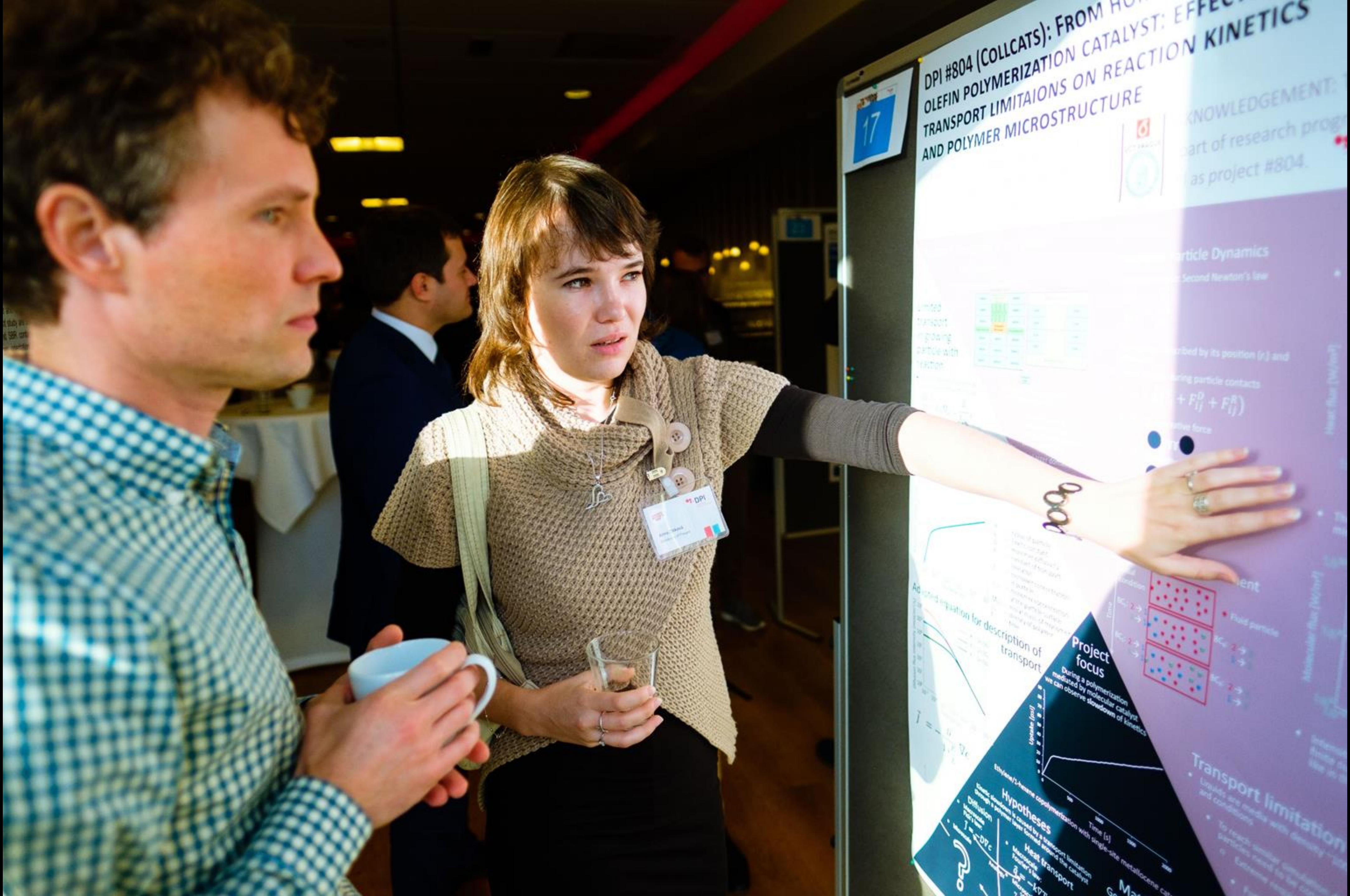
FACULTY OF ENGINEERING AND ARCHITECTURE
DPI
DSM
J. SOMMER, W. VAN PAEPEGEM
FATIGUE DESIGN TOOL FOR MATRIX CRACKING AND
IN LAMINATED COMPOSITES
Modeling methodology
Testing methodology
New results on validation of variational approach with finite Element Method under complex bending loads
Structure and Dynamics


DPI


NEXT LEVEL
Development
DPI
The Polymer
Research Platform


NEXT
LEVEL
Research
ILCC 2016


34
DPI
NWO
TU/e
Programmable helical twisting in oriented bilayer films
Ir. Rob Verpaalen
dr. M.G. Debije, dr. ing. C.W.M. Bastiaansen, dr. ir. T.A.P. Engels
Introduction
In a continuous search for novel, high-end products, traditional commodity polymers form an interesting class of materials to introduce new functionalities. The existing industrial infrastructures should preferably undergo only minor changes to extend their range of application, as for example in stimuli-responsive, smart textiles and soft robotics. Here, a low impact, though elegant, method is employed in which a liquid crystal network (LCN) coating is spray-applied onto stretched and extremely humidity-sensitive polyamide 6 (PA6) films. The films demonstrate helical twisting as a chiral dopant was added to the liquid crystal (LC) mixture, eliminating the need to cut films at an angle.
Materials and Methods
A 4 µm LC coating was spray-applied onto a commercially available oriented PA6 film (15 µm) to prepare humidity-sensitive bilayer actuators (Scheme 1). The LCs (LC1-4) were copolymerized after UV-initiated cleavage of the initiator to form a LCN. A helical twist in the bilayer is created by the addition of a small amount of a right-handed chiral dopant (CD).
5 %RH
40 %RH
80 %RH
0°
22.5°
45°
67.5°
90°
Scheme 1: A. The photopolymerizable liquid crystals LC1-4 and chiral dopant CD. B. Bilayer preparation procedure.
Acknowledgement
Reference
R. C. P. Verpaalen, J. Mater. Chem. A, 2018, 17724-17729
SFD / Stimuli-responsive functional materials and devices


DPI #804 (COLLCATS): FROM
OLEFIN POLYMERIZATION CATALYST:
TRANSPORT LIMITAIONS ON REACTION KINETICS
AND POLYMER MICROSTRUCTURE
17
Project focus
During a polymerization mediated by molecular catalyst we can observe slowdown of kinetics
Hypotheses
equation for description of transport
Transport limitation


24
17
MODELLING
15


24
17
15


27
25
DPI
Motivation/Aim
Giuseppe Portale1,2


DPI
Ronald Korstanje
DPI


DPI


11
DPI
Richard Schaake


10
(SUSPENS)


11


Heineken


IER COMTE
FIER CO


Holiday Inn
Welcome


Holiday Inn
Welcome


DPI


DPI