2024 *at a glance*

Advanced Research Center
Chemical Building Blocks Consortium

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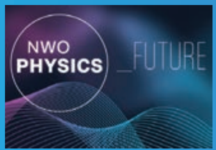

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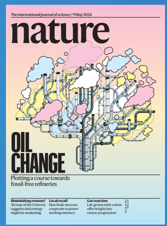

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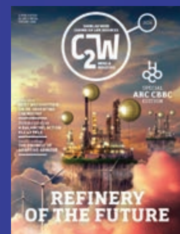


3-4 December
NWO CHAINS

IN THE SPOTLIGHTS

Jens Tolboom (UvA)

When it comes to paint, we're quite spoiled: we expect it to be fluid when applied and to dry as quickly as possible afterwards. To most, this is perfectly normal. However, what many people don't realise is that this process doesn't just happen on its own – there is a lot of chemistry behind it. How do you prevent your paint from drying too soon, and thus a skin from forming in the tin, while ensuring it dries quickly once applied to the wall?

Conventional paints contain substances that prevent a skin from forming in the tin and others that accelerate the drying process immediately after application. However, these substances may be harmful, so it would be ideal if their use could be avoided. Jens Tolboom is working on a solution for this at the University of Amsterdam. He is developing a sustainable catalyst that can be added to paint, using a very clever trick: a light switch.

Jens Tolboom receives Best Young Scientist Contribution Award at ETCC 2024

A light-sensitive switch is a promising concept for drying paint: still in the tin, it's kept in the dark, while once applied to the wall, it's exposed to an abundance of light. If paint were to dry as a reaction to light, it would have precisely the properties you want. Jens is designing iron-based catalysts that accelerate drying when exposed to light. Is there no light? Then the catalyst remains inactive, and the paint won't dry. Is there enough light? The catalyst becomes active, and the paint will dry. Doesn't that sound ideal?

Still, there are some obstacles to overcome. What about dark-coloured paint, such as black or dark blue paint? The pigments that give the paint its colour block the light from entering it. And if the light fails to reach the catalysts, they will remain inactive, and the paint will not dry. Jens is looking for a solution for specifically that problem. He is doing this by designing catalysts that use the specific part of light that is nevertheless able to pass through pigments, and which will be activated even in dark-coloured paints.

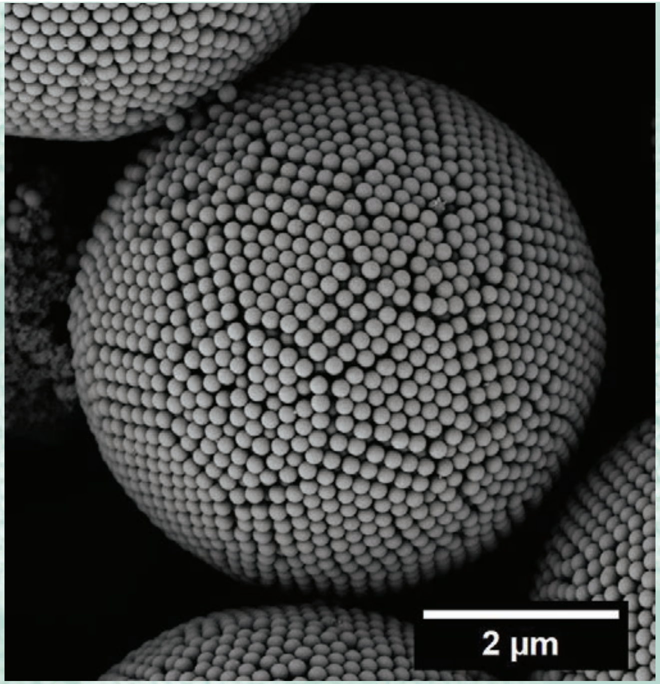
The addition of such catalysts could make paint more sustainable and help avoid the use of potentially harmful substances. We are eagerly looking forward to the day when the product of Jens' research can actually be found in tins of paint. Jens was conferred the Best Young Scientist Award at the 2024 ETCC conference, so he's well on his way!

IN THE SPOTLIGHTS

Marina Karsakova (RUG)

We all know the disappointment when our brightly coloured items start to lose their charm. Why does this happen? Most often, it's because the colour fades, losing the vibrant appeal it had when it was new. It's a shame, especially when they still work perfectly fine! But what if we could create colours that don't fade, keeping our items as vibrant as the day we bought them? This is exactly what Marina Karsakova is investigating in her research at the University of Groningen.

Many colours fade over time because the pigments or dyes in paints and fabrics break down under the influence of light. Take, for example, an old red car left outside for years—its once-brilliant paint becomes dull. This happens because the molecules in the paint, called chemical pigments, absorb light and undergo structural changes. These changes alter the molecules so much that they effectively transform into a different substance with a different colour. Therefore, over time, the bright red turns faded and lacklustre.



This fading doesn't just affect cars or clothing—it happens to many products, which are often replaced simply because they no longer look appealing, even though their functionality remains intact. Marina's work aims to solve this problem by developing "structural pigments" that don't fade, even when exposed to light.

So, what makes structural pigments special? Unlike traditional chemical pigments, structural pigments create colour through their physical structure rather than through chemical compounds that can break down. These structural pigments, as pioneered by the Van Blaaderen Group at Utrecht University, are made from tiny, ordered spheres, often using inexpensive and durable materials like sand. These spheres interact with light in precise ways to produce vibrant, stable colours that don't fade. Amazingly, using just one material, it's possible to create all the colours of the rainbow, from blue to red. Although the individual spheres are far too small to see with the naked eye, their effect is impossible to miss—they ensure colours stay brilliant over time.

Photo left: Marina's structural pigments
Photo below: Marina receiving the Poster Prize at the ARC CBBC Community Event

- Marina Karsakova in C2W ARC CBBC special
- ARC CBBC Community Event 2024

Marina is using this method to design sustainable pigments that last longer and retain their colour intensity. The research she conducted in 2024 also earned her two poster prizes in one and the same month, both at the ARC CBBC Community Event and the Münster Symposium on Intelligent Matter. And, as the icing on the cake, her research was given a prominent place in C2W's special ARC CBBC edition!

Our Story

As illustrated by our slogan 'Reinventing chemistry together', ARC CBBC has been serving as a bridge between the academic world and the chemical industry for eight years now. This public-private partnership brings out the best in both worlds, in which academic need-to-know and industrial need-to-have inspire one another other think beyond the boundaries of individual disciplines. With over 60 projects, we are well on the road to achieving our goals – but still have a distance to travel.

Our first projects were launched in 2016. They were set up in conjunction with our hub universities (Utrecht University, the University of Groningen and Eindhoven University of Technology) and our founding industrial partners (AkzoNobel, Shell, BASF, Nouryon and Nobian). The first three multilateral projects we launched were Coatings, Small Molecule Activation and Fundamentals of Catalysis. Aside from these, multiple projects were initiated by the above organizations as well as associate partners throughout the Netherlands, all with a view to optimizing the exchange of expertise.

In the meantime, eight years have passed. Our first projects have largely been concluded, but that does not mean that we have reached our goal. The topics we are addressing are still far from resolved. This is why we have launched new multilateral projects that continue where their predecessors left off: Smart Coatings, Methane Pyrolysis and CO_2 Conversion.

Our purpose is to rethink the design of the chemical building blocks that make up the products of our everyday lives, and the convenience they bring us. We investigate manufacturing routes and the use of chemical feedstocks and processes, and examine these with a critical eye. We unite universities, researchers, industries and government, with whom we collaborate closely – to greenify the chemical industry, the develop new chemistry for future industry and to educate the next generation of chemists.

Greenifying Chemistry

Despite the diversity of projects that are being launched and rounded off, our focus remains unchanged: To greenifying chemistry to accelerate the transition towards Sustainable Advanced Materials made by Circular Process and Energy Technologies as a basis for a Safe and Healthy society and a Waste-free Circular economy.

Our Research

Our research programme is constructed around the principle of developing alternative and – above all – greener methods for the chemical industry. Our ultimate goal is to close 'the product loop' and, by doing so, transform it into a fully recyclable model.

Therefore, part of our programme focuses on the conversion of various types of feedstocks for the bulk chemicals industry, including biomass, CO_2, natural gases (such as methane) and plastic waste. ARC CBBC conducts both bilateral and multilateral projects. Our bilateral, topic-specific research is carried out in close collaboration with our industrial partners' R&D divisions. Together, we aim to improve specific industrial processes where they matter most. The multilateral projects are set-up in collaboration with all industrial partners focusing collectively on one specific common goal. These have the potential to yield ground-breaking results in the race towards a green and circular industry.

The results of our work regularly find their way to a huge diversity of scientific journals. Several of these publications were even featured on their covers! A comprehensive overview of our publications can be found on our website.

Photo: Researchers Floor Brzesowky (left) and Sofie Ferwerda (both Utrecht University) shining light on IR cell in lab

1. The energy transition

Our energy supply has always been based on the use of fossil fuels, and moving away from this is far easier said than done. A key element in the transition to clean energy is the switch to electricity as an energy source. We are constantly learning more about how to generate this more sustainably. This process, called electrification, is becoming increasingly visible all around us, as illustrated by the increasing popularity of electrically powered cars and heat pumps. Switching to electricity as an energy source is also of crucial importance in the chemical industry. Of course, this does require the redesign of the customary chemical production processes. Our chemists are eager to set to work on reinventing these processes and making the switch to electrically powered production processes. One of these chemists is Alexandra Matei, whose work is presented on Page 14.

2. The materials transition

What is better than the sustainable manufacture of new products? Ensuring that the products we are already using are safe and sustainable by design! We can take a significant step in the right direction by ensuring that products last longer or can be augmented with additional functions, so that no new products need to be made. Redesigned materials also lead to energy savings. Can we create more efficient catalysts, for example, so that chemical reactions are less energy-consuming? And can we simultaneously ensure that the production of these catalysts no longer require the use of expensive and hazardous materials? Take a look at Jens Tolboom's research on Page 4 for a fine example of this.

3. The feedstock transition

Many of our products have their origins in non-renewable feedstocks. Plastics, cleaning agents and other products made by the chemical industry are all examples of this. By replacing these non-renewable, often fossil feedstocks with renewable alternatives, we can take a significant step in the greenification of the chemical industry. Can we use waste, such as plastics, CO_2 and biomass to make our products? The projects led by Işıl Yeşil Gür (Page 9) and Bas den Hartigh (Page 10) are both excellent examples of this transition.

IN THE SPOTLIGHTS

Işıl Yeşil Gür (TU/e)

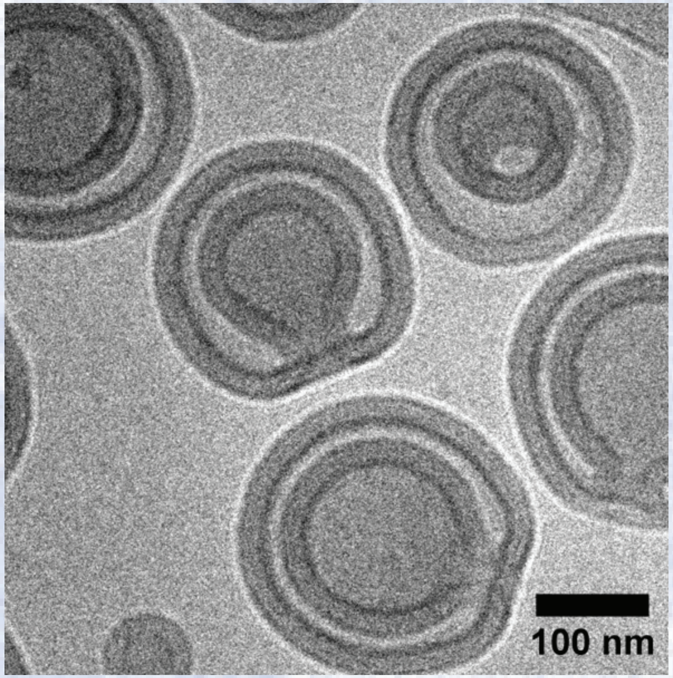
Over the past few decades, we have become highly dependent on plastics due to their outstanding practical properties and durability. However, these same qualities also pose a significant drawback. Once discarded, plastic products become a major societal concern – yet plastic waste, if repurposed as a raw material, could potentially help meet the demand for a wide range of products. Couldn't we simply use plastic waste – currently a major problem – as a feedstock instead of fossil raw materials like petroleum? The real challenge lies in finding a way to turn that plastic into reusable materials.

The answer to this question depends entirely on the type of plastic, and the desired end product. Işıl Yeşil Gür is working at Eindhoven University of Technology on polyolefins – a group of thermoplastics widely used in food packaging, among other applications. She is developing tiny machines called nanoreactors that convert polyolefin waste into usable materials. The end products she aims to produce through her research include new raw materials for plastic manufacturing as well as fuels.

The nanoreactors created by Işıl are bowl-shaped, with a central cavity. In the very centre of the nanoreactor, the plastic waste is broken down and converted into products that can be reused.

The cavity of the nanoreactor houses a specially developed catalyst, which is ultimately responsible for carrying out the entire process. This catalyst is being developed by Victor Drozhzhin, a researcher at ARC CBBC, as part of Işıl's multilateral project 'New Chemistry for a Sustainable Future'. It's a great example of how our researchers collaborate to develop innovative, sustainable solutions for the future!

Photo below: Işıl's nanoreactors



IN THE SPOTLIGHTS

Bas den Hartigh (UU)

If any example truly embodies the modern mantra 'from waste to resource,' it is the use of CO_2 as a feedstock. Carbon dioxide is arguably the biggest threat to our climate today – one we often wish would simply disappear. But if we could repurpose CO_2 as a feedstock, we could achieve two goals at once: lowering CO_2 levels while decreasing our manufacturing industry's reliance on fossil resources. And this isn't just wishful thinking – the process is already taking shape in laboratories, such as the one at Utrecht University where Bas den Hartigh is working.

CO_2 is a highly stable molecule, perfectly content in its current form. However, while this might seem like an advantage, it actually makes CO_2 much harder to process. Processing CO_2 requires significant amounts of energy, and consequently, money and raw materials. To transform CO_2 into usable feedstocks, catalysts are often employed. Given the wide variety of catalyst types and sizes, their design is crucial to their efficiency in converting CO_2.

Bas is working on what is referred to as the 'hydrogenation' of CO_2, which means that he is adding hydrogen atoms to CO_2 molecules. This process is actually the opposite of what happens when fuels like natural gas and petrol are burned, where the hydrogen atoms are stripped from the fuels. Hydrogenation essentially reverses the combustion of these fuels, resulting in new fuels or building blocks for creating other synthetic products.

In his research, Bas is investigating how hydrogenation of CO_2 occurs on the catalyst. He is examining the role of the different building blocks of the catalyst, cobalt and titanium oxide, and how they support each other. With a better understanding of this process, we can create more effective catalysts and bring the application of CO_2 conversion in society one step closer. Bas also presented his research at the 2024 ChemistryNL Future Festival.

ARC CBBC at the ChemistryNL Future Festival

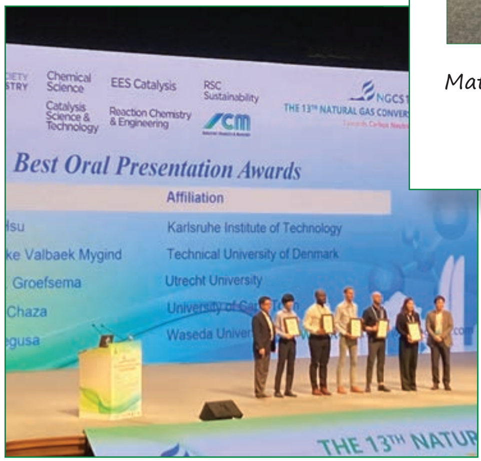
Outreach - events

You have probably encountered ARC CBBC at various places last year. Aside from the events hosted by our organization, where we offered various researchers and organizations an opportunity to present themselves, we participated in several external events.
We were also visible in various media! You can find this on page 12.

Rohit Raj at ChemistryNL Future Festival
photo: Bram Becks

ARC CBBC Community Event
photo: Marijke Badings

Matteo Monai at NWO CHAINS



Daan Groefsema at Natural Gas Conversion Symposium

ARC CBBC visit to BASF Ludwigshafen

Nathália Tavares Costa at N3C

Outreach - in the media

Besides the ARC CBBC special that C2W magazine published, our people appeared in various media outlets. Find out more about them and their research!

In 2024, C2W magazine published a special edition about ARC CBBC. An edition with all you need to know about ARC CBBC, and full of stories from our researchers!

Thomas Freese (RUG) in Nature Spotlight "The Trials and Triumphs of Sustainable Science"

Thomas Freese (RUG) in C2W "Improving Sustainability Starts in your Own Lab"

Nong Artrith (UU) in Eye Openers "Harnessing AI for a Greener Future"

Maurits de Roo (RUG) in Eye Openers "Doing Chemical Reactions using Electricity instead of Chemicals"

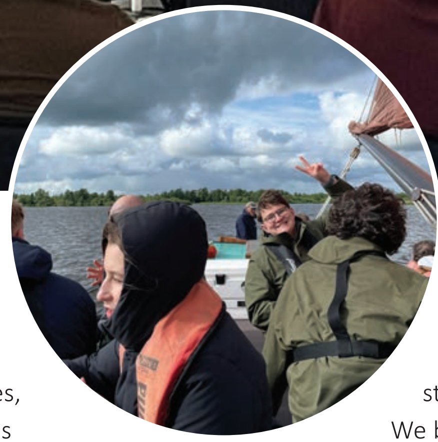
George Hermens (alumnus) in VVVF "George Hermens, Researcher bij AkzoNobel"

Daniela Rodrigues Silva (VU) in C2W Magazine: "Steric effects often overlooked"

Bert Weckhuysen (UU) in de Volkskrant "Klimaatneutraal staal smelten, cement maken en plastic produceren? Dat kan, maar je moet er wel wat voor over hebben"

Bert Weckhuysen (UU) in MO* Magazine "Nederlands onderzoek in Nature: 'Fossielvrije raffinaderij mogelijk in 2050'"

Education



The ARC CBBC education program plays a crucial role in our consortium's strategy to equip the next generations of scientists and employees. Our main goal is to undergo four years of intensive scientific development, but at the same time foster collaborative skills, soft skills, and expertise exchange, complemented by active industry involvement.

ARC CBBC Summer School 2024

Top photo: Interdisciplinary training from Jessica Oudenampsen during ARC CBBC Summer School
Round photo: Sailing on a Frisian skûtsje during ARC CBBC Summer School

A significant component in our education programme is our annual Summer School. During the Summer School, for three enriching days, we bonded over a shared mission through community-building activities, insightful scientific lectures, practical business cases, engaging workshops, and an unforgettable boat trip. As part of our commitment to sustainable industry, we invite our partners to host a day during this three-day event. This year, we were honoured to visit BASF in Heerenveen. Rob Gosselink and Gerald Metselaar from BASF curated an active program featuring four business cases centred on sustainability. During the summer school, our students presented their innovative perspectives on specific topics within BASF's sustainability strategy to BASF's experts in Sustainability and R&D.

ARC CBBC wants its PhD students to be involved in today's society; to be able to convey the importance of their research to the general public, stakeholders, industry and politics. We believe that talent manifests itself in various skills. Being an excellent scientist is one, but so is the ability to take on a leadership role or enthuse a lay audience for your work. All those qualities help shape the researchers of today. As such, ARC CBBC offers workshops that focus on helping students improve their soft skills. A prime example of this is a presentation training course that is given each year. This popular course is well-received, and the students who take part in it are often invited to present their research at events organised by ARC CBBC.

IN THE SPOTLIGHTS

Alexandra Matei (RUG)

Sometimes, you know instantly what you want to achieve. Whether it's a goal, a destination or a product: you often know exactly what you want. The same applies to the greenification of society. We know what we want to achieve. We want to reduce our CO_2 emissions, produce less waste, and turn any waste nevertheless produced into reusable feedstock – and so on.

However, the chemical processes leading to these solutions are often highly complex, expensive, dependent on rare metals, or energy intensive. Our goals may be crystal-clear, but the journey to achieve them is often fraught with many obstacles. Can't we find a way around them? That is exactly what Alexandra Matei is seeking in her research at the University of Groningen.

Alexandra is not so much working on a product, but a chemical production process. She is developing a methodology designed to minimise adverse effects: she uses inexpensive catalysts that are readily available in large quantities and strives to use water or air as benign parts of the chemical reactions. Many chemical processes rely on complex additives, so shifting to water or air would significantly reduce both costs and effort. In addition, she uses electricity or light as an energy source for her reaction, both of which are derived from sustainable means. She also endeavours to ensure that her process generates the least possible amount of waste. This may sound like an ideal world, but Alexandra is working to turn it into reality. By focusing on the process itself rather than the feedstock, she can concentrate fully on enhancing its sustainability without being constrained by peripheral requirements. Obviously, the next step is to determine the applications for which this process can be used.

You could compare Alexandra's work to designing a new route through a complex landscape. The starting point of her journey is not the most important; instead, the focus is on the journey. Once the route is mapped out, hopefully, a new path will unfold on the route to a more sustainable world.

IN THE SPOTLIGHTS

Jonas Gans (DIFFER)

DIFFER, the Dutch Institute for Fundamental Energy Research, is one of ARC CBBC's newest partners. This institute specialises in fusion energy and chemical energy research, making it a brilliant asset to the consortium. The first official project at DIFFER has been in progress for some time now: PhD candidate Jonas Gans is conducting research at DIFFER into the production of nitrogen oxides (NO_x i.e. NO and NO_2) through plasma technology.

Key uses of NO_X are the manufacture of nitric acid an indispensable component for the production of polyurethane, a widely used synthetic material, and ammonium nitrate, an effective and common fertiliser. However, the production of NO_X is contingent upon an industrial process that is among the most polluting worldwide, as it requires the use of hydrogen. The 'grey' hydrogen used in this process is today still predominantly derived from natural gas, releasing CO_2. Although numerous initiatives have already been established to produce 'green' hydrogen, the demand for this green hydrogen far exceeds the supply, so we, for now, unfortunately remain dependent on grey hydrogen.

Redesigning the NO_X production process to eliminate the need for hydrogen altogether would be a great help – and this is exactly what Jonas aims to do. He is examining the possibility of heating nitrogen and oxygen, both of which are readily available in our atmosphere, to such an extent that they will 'merge into' NO_X, as it were. That would save a lot of fossil feedstocks and prevent a great deal of the accompanying emissions. There is, however, one obstacle: the optimal temperature for this process is around 3200°C. Obviously, this is very difficult to achieve!

This is exactly where the expertise at DIFFER proves invaluable. DIFFER's plasma technology can achieve temperatures of up to 9000°C – in an energy efficient way, thus not only providing the perfect environment for the reaction but also a perspective for the temperature problem. Jonas is using this plasma reactor in his research; he is converting nitrogen and oxygen gases into plasma, a state in which atoms are separated and form a kind of 'atomic cloud' which will be controlled in a way that the atoms can recombine to form NO_X.

The challenge, however, is the competitiveness against established fossil-based production ways on an energy level. Therefore, one aspect of Jonas Research is focused on energy costs, because the process will need to become a lot more energy-efficient to be economically viable. If Jonas' research proves a success, this would give us a new, sustainable production option.

Awards, Grants and other Honours

Click them to learn more!

Bert Weckhuysen
- receives Earl L. Muetterties Memorial Lectureship in Chemistry
- receives Honorary Doctorate at Ghent University Belgium
- receives Incubator Grant
- receives Karl Wamsler Innovation Award 2024

Jan van Hest
- receives ERC Advanced Grant

Daan Groefsema
- Receives Best Oral Presentation Award at Natural Gas Conversion Symposium

Adri Minnaard
- receives Ammodo Science Award

Nikolay Kosinov
- receives ERC Consolidator Grant
- receives NWO ENW-M1 Grant

Xinwei Ye
- awarded Embassy Science Fellowship

Ben Feringa
- becomes Member of the American Philosophical Society

Hans Kuipers
- receives Knighthood in the Order of the Netherlands Lion

Bas de Bruin
- becomes Scientific Director of the Van 't Hoff Institute for Molecular Sciences

Jens Tolboom
- receives Best Young Scientist Contribution at ETCC

Petra de Jongh
- receives ERC Advanced Grant

Wiebe de Vos
- Inauguration as professor

Ina Vollmer
- receives ERC Starting Grant
- receives Incubator Grant
- receives NWO Demonstrator Grant

Marina Karsakova
- receives Poster Prize at ARC CBBC Community Event
- receives Poster Prize at the Münster Symposium on Intelligent Matter

Our People

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Prof. Hans Kuipers – Eindhoven University of Technology
Ir. André van Linden – AkzoNobel
Dr Peter Berben – BASF
Dr Rob Gosselink – BASF
Dr Evren Ünsal – Shell

The EB members are supported by the following knowledge experts:
Dr Jitte Flapper – AkzoNobel
Dr ir. Sander van Bavel – Shell
Manon van Asselt – NWO

The following members have left the EB in 2024:
Dr Peter Berben – BASF

The following member has joined the EB in 2024:
Dr Rob Gosselink – BASF

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Prof. Anton Pijpers – Utrecht University
Dr Katrin Friese – BASF
Dr David Williams- AkzoNobel
Prof. Joost Frenken- University of Groningen
Prof. Dr Silvia Lenaerts – Eindhoven University of Technology
Prof. Rolf van Benthem – Shell

The SB members are supported by the following observers:
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Manon van Asselt MSc – NWO

The following members have joined the SB in 2024:
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Prof. Ferdi Schüth – Max-Planck-Institut für Kohlenforschung, Germany
Prof. Timothy Swager – Massachusetts Institute of Technology, USA

continued on next page >>

Prof. Guy Marin, Deputy Chair – Ghent University, Belgium
Prof. Beatriz Roldan – Fritz Haber Institute of the Max Planck Society, Germany
Prof. Helma Wennemers – ETH Zürich, Switzerland
Prof. Unni Olsbye – University of Oslo, Norway
Prof. Raffaella Buonsanti – EPFL, Switzerland
Prof. Marc-Olivier Coppens – University College London, UK
Dr Hélène Olivier-Bourbigou – IFP Energies Nouvelles, France

The following members have joined the SAB in 2024:
Prof. Raffaella Buonsanti – EPFL, Switzerland
Prof. Marc-Olivier Coppens – University College London, UK
Dr Hélène Olivier-Bourbigou – IFP Energies Nouvelles, France

The following member has left the SAB in 2024:
Prof. Guy Marin, Deputy Chair – Ghent University, Belgium

Photo: David de Wied building
Photo right: Lecture Ellard Hooijveld at the ARC CBBC Community Event
Photo page 18: Vening Meinesz building

Members
Prof. Adri Minnaard – Groningen University
Prof. Albert Schenning – Eindhoven University of Technology
Prof. Alfons van Blaaderen – Utrecht University
Prof. Atsushi Urakawa – Delft University of Technology
Prof. Bas de Bruin – University of Amsterdam
Prof. Ben Feringa – University of Groningen
Prof. Bert Weckhuysen – Utrecht University
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Dr Nong Artrith – Utrecht University
Prof. Peter Bolhuis – University of Amsterdam
Prof. Petra de Jongh – Utrecht University
Prof. Pieter Bruijnincx – Utrecht University
Prof. René Janssen – Eindhoven University of Technology
Prof. Richard van de Sanden – DIFFER
Prof. Ruud van Ommen – Delft University of Technology
Prof. Sijbren Otto – Groningen University
Prof. Syuzanna Harutyunyan – Groningen University
Prof. Thijs Vlugt – Delft University of Technology
Prof. Wesley Browne – Groningen University
Prof. Wiebe de Vos – University of Twente

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Dr Eline Hutter – Utrecht University
Dr Ina Vollmer – Utrecht University
Dr Michael Lerch – University of Groningen
Dr Sebastian Beil – University of Groningen
Dr Nikolay Kosinov – Eindhoven University of Technology
Dr Marta Costa Fiqueiredo – Eindhoven University of Technology

The following Assistent Professor has left in 2024:
Dr Sebastian Beil – University of Groningen

Technicians
Ing. Hannie van Berlo- van den Broek – Utrecht University
Dr Ramon Oord – Utrecht University
Dr Peter de Peinder – Utrecht University
Ing. Larry de Graaf – Eindhoven University of Technology
Ir. Brahim Mezari – Eindhoven University of Technology
Lotte Stindt MSc – University of Groningen
Dr Alexander Ryabchun – University of Groningen

The following technicians have joined in 2024:
Lotte Stindt – University of Groningen
Dr Alexander Ryabchun – University of Groningen

ARC CBBC Support Office
The ARC CBBC Support Office is hosted by the coordinating partner, Utrecht University.
Anita ter Haar – Financial Controller
drs. Hannah Thuijs – Consortium Manager
Dr Esther Groeneveld – Consortium Manager
Anita den Heijer – Office Manager
Masja Spijkstra – Project Coordinator
Jeroen Meijer MSc – Communication Advisor
Marijke Badings – Communication Officer / Graphic designer

Our New Researchers

The following PhD candidates and postdoctoral researchers have joined ARC CBBC in 2024.

Paul Wienecke
(RUG; PD)

Marika Di Berto Mancini
(RUG; PD)

Stefan Bouts
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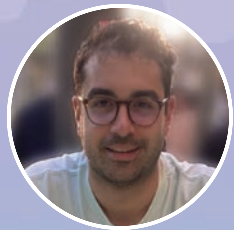
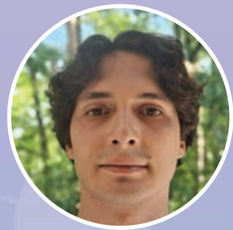
Aleksandr Bashkatov
(UT; PD)

Yixin Zhang
(UT; PD)

Rik Bennis
(UvA; PhD)



Alessio Baldelli
(TU/e; PhD)



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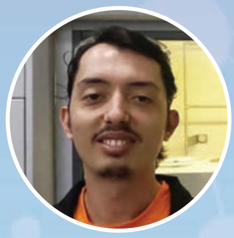

Ferit Begar (RUG; PhD)

Devanshu Sajwan (UU; PhD)

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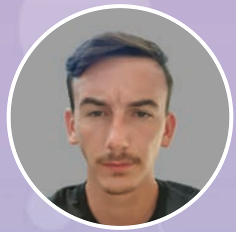

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Aniket Ambekar (TU/e; PD)

Our Alumni

The following people have successfully defended their thesis in 2024, and can now call themselves ARC CBBC alumni!

Johan Bootsma (UvA)

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Marie Brands (UvA)

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