

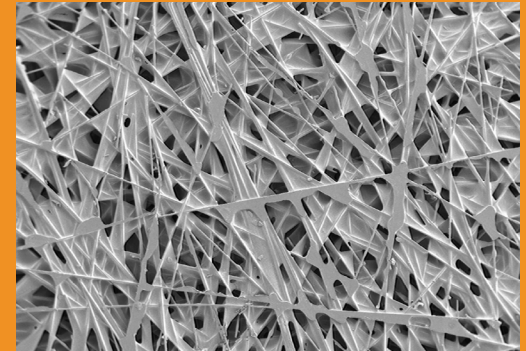
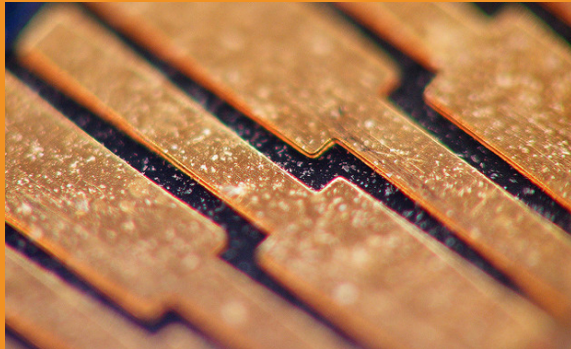
Welcome to the 4th 4TU.HTM symposium

Dutch Materials

October 12, 2018



UNIVERSITY OF TWENTE.



4TU.HTM

4TU Research Centre High-Tech Materials (4TU.HTM)

aims to

- strengthen collaboration between the four TU's
- strengthen the research field Materials Science and Engineering
- stimulate education in Materials Science and Engineering

4TU.HTM



- Officially established November 10, 2014
- Research programme *New Horizons for Designer Materials*,
2016 – 2019
- 4TU.HTM will continue its activities in 2019 – 2021
- k€ 150 per year for organisation and activities

Activities 4TU.HTM

- Research programme *New horizons for designer materials*
- Yearly symposium Dutch Materials
- Support & organise joint Materials Science workshops
- Improve accessibility Materials Science and Engineering
- Stimulate Summer Schools and Graduate Courses
- Finance collaborative projects
- Develop activities to attract students
- Website www.4TU.nl/HTM



Research programme *New horizons for designer materials*

- *Understanding structure formation in hierarchical hybrid materials through in situ liquid phase microscopies*, Joe Patterson, Mohammad Moradi (TU/e)
- *“From Flatland to Spaceland“: towards advanced, 3-dimensional materials bottom-up, from polymer decorated nano- and microstructures*, Maciek Kopec (UT, TU/e)
- *Reversible crosslinking: a potent paradigm for designer materials*, Nick Tito (TU/e)
- *Metamaterials with tunable dynamical properties*, Priscilla Brandão Silva (TU/e)
- *Superconducting carbon nanotubes composite as vertical interconnect for qubit integration at cryogenic temperature*, René Poelma, Amir Mirzagheytaghi (TUD)
- *Communicating surfaces*, Danqing Liu, Wanshu Zhang (TU/e)

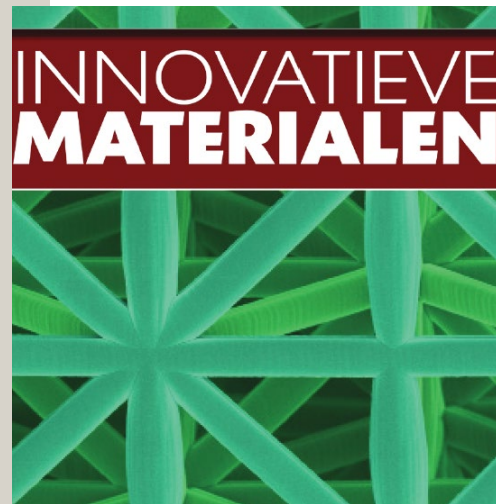
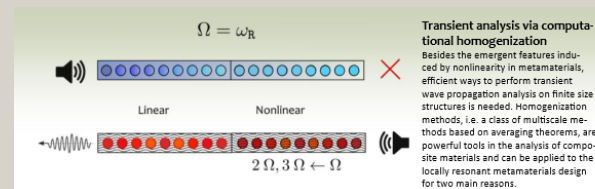
Research programme *New horizons for designer materials*

The programme will end in 2019; for the coming time no new 4TU research programme in materials.

Collaboration and visits of international experts.

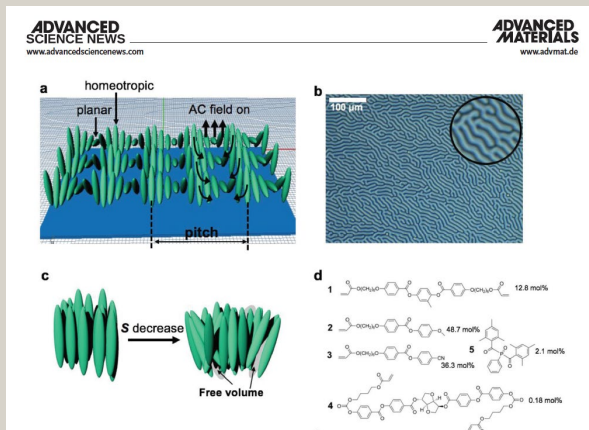
Personal grants for Joe Patterson and Danqing Liu.

Scientific publications, articles in *Innovative Materials* (English and Dutch).



extraordinary features of materials emerge from the effective properties of the composite material in its constituents. Secondly, the feature of the locally resonant materials is their subwavelength scale which makes them suitable for metamaterials. Recently, both analytical and computational homogenization methods have been extended to incorporate inertia and allow complex interactions. When complex interactions need to be modeled in computational homogenization, the numerical implementation can be used and are typically more efficient than the conventional local simulations.

ham et al. [7] extended the computational homogenization to incorporate micro-dynamics. The numerical implementation at that time was restricted to isotropic locally resonant metamaterials. Within the framework of the Tech Materials research



4TU.HTM

2019 – 2021

- relation with industry
- graduate education for Ph.D. students
- experimental facilities

Geachte heer Sietsma,

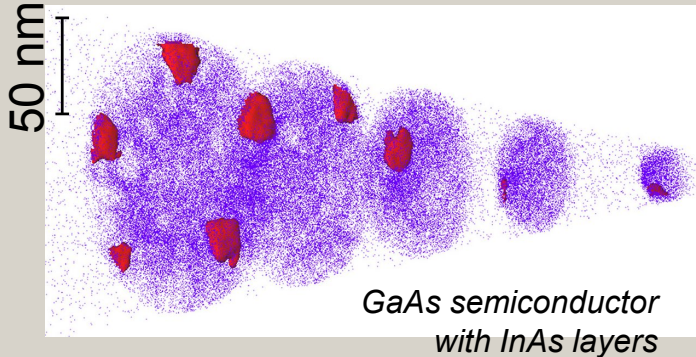
Op 29 augustus 2018 is in 4TU.Onderzoek gesproken over de voorzetting van de activiteiten van 4TU.High Tech Materials. In de plannen voor de toekomst geeft u prioriteit aan een bredere en structurele opleiding van promovendi, de bevordering van de relatie met de industrie door een strategisch partnership met M2i, de vergroting van de zichtbaarheid en toegankelijkheid van experts en faciliteiten en de "Joint Materials Science Activities", waaronder een jaarlijkse conferentie.

De plannen zijn aanleiding om 4TU.HTM voor een periode van drie jaar (2019-2021) een budget toe te kennen van k€ 150 per jaar uit de middelen van 4TU voor het continueren van uw netwerkorganisatie. Het budget voor 2019 komt in de plaats van de eerder (brief 4TU-UIT-290/1) toegekende k€50 voor 2019.

example: Atom Probe Tomography

Atom Probe Tomography

- element-specific 3D microscopy at the atomic scale
- can be combined with TEM
- applicable to many types of materials
- National Facility at TU Eindhoven
- high running costs: *high usage degree needed!*
- poster & demo dr. Sebastian Kölling (S.Kolling@tue.nl)
- contact prof. Paul Koenraad (P.M.Koenraad@tue.nl)



Martensite and austenite in
steel (scale in nm)

Equipment website:
<http://materialequipment.4tu.nl/>

- specifications and contact for equipment at the four universities
- Delft and Twente are filling the database now, Eindhoven and Wageningen to follow
- the website is accessible, but no yet complete
- feedback is very welcome
- Mithun Mendez
mithun.martin.215@gmail.com

<http://www.4TU.nl/HTM>

Stereo microscope Olympus

The stereo or dissecting microscope uses two separate optical paths with two objectives and two eyepieces to provide slightly different views at angles to the left and right eyes. In this way it produces a three-dimensional (3-D) visualization of the sample being examined.

Contact

Sander Van Asperen

Mechanical, Maritime and Materials Engineering (3mE)

s.vanasperen-1@tudelft.nl

015 2782189



Mechanical, Maritime and Materials Engineering
(3mE)

Specification

Additional Resources



materialEquipment.4tu.nl/search?electron+microscope

4TU HTM

electron microscope

Instrument Name	University	Location	Contact
Scanning Electron Microscope (SEM) JSM 6300	TU Delft	Mechanical, Maritime and Materials Engineering (3mE)	Jos van Driel
Scanning Electron Microscope (SEM) - JEOL JSM 6500F	TU Delft	Mechanical, Maritime and Materials Engineering (3mE)	Ing. C. Kwakernaak
Transmission Electron Microscope FEI Monochromated Tecnai 200STEM-FEG	TU Delft	Applied Science (AS)	Dr. Ir. F.D. Tichelaar
Transmission Electron Microscope Philips CM300UT-FEG	TU Delft	Applied Science (AS)	Dr. Ir. F.D. Tichelaar
Transmission Electron Microscope Philips CM30T	TU Delft	Applied Science (AS)	Dr. P.J. Kooyma
Environmental Scanning Electron Microscope (ESEM)	TU Delft	Faculty of Civil Engineering and Geosciences	Arjan Thijssen

MATERIAL CLASSES

- Metamaterials
- Bio- / bio-inspired materials
- Soft materials
- Metals
- Polymers
- Ceramics
- Semiconductors
- Composites

PRODUCTION

- Recycling
- Primary processing
- Deformation
- Thermal treatment
- Chemical reactions
- Depositioning
- Additive manufacturing
- Joining

MATERIAL

- Thin film
- Design of materials
- Structure
- Characterisation

PERFORMANCE

- Extreme conditions
- Mechanical behaviour
- Functional properties
- Catalysis
- Surface quality
- Ageing
- Self-healing

SCIENCE & ENGINEERING

- Dynamic processes in materials
- Thermodynamics
- Physics
- Chemistry
- Surface / interface engineering
- Computational methods
- Mathematics
- Sustainability

Website to find materials expertise

<http://hightechmaterials.4tu.nl/>

<http://www.4TU.nl/HTM>

The screenshot displays the 4TU.HTM website interface. At the top, there are navigation menus for 'MATERIAL CLASSES (1)', 'PRODUCTION', 'MATERIAL', 'PERFORMANCE', and 'SCIENCE & ENGINEERING (1)'. Below these, a network diagram shows various researchers and their affiliations. Key individuals highlighted include Michael Deblige (TU Delft) and Arjan Mol (TU/e). The network also includes researchers from Wageningen University and other institutions. The TU/e logo is prominently displayed in the center of the network.

website <http://www.4TU.nl/HTM>

The screenshot shows the homepage of the 4TU.HTM website. At the top, there is a navigation bar with the 4TU.Federation logo and a menu including Home, Research, New Horizons, Education, Funding, People, Events, 4TU.HTM News, About 4TU.HTM, and Agenda. A search bar is also present. The main content area features a large banner for 'High-Tech Materials' with a microscopic image of a material and the 4TU.HTM logo. Below this, there is a 'Latest updates' section with three columns of news items. The first column contains an article about 'Dutch Materials 2018' with a photo of a conference. The second column features a '4TU.High-Tech Materials search tool' with a screenshot of the website's search interface. The third column shows a tweet from @4TU_HTM about the Dutch Materials 2018 event. At the bottom, there are three more items: a 'Special Seminar Prof. Wong' with a photo of a man, an 'Innovative Materials (digital magazine)' with a grid of colorful dots, and '4TU.HTM News on Twitter' with a screenshot of the website's Twitter feed. On the right side of the page, there is a vertical 'FEEDBACK' button.

4TU.Federation Home Research New Horizons Education Funding People Events 4TU.HTM News About 4TU.HTM Agenda

Home > High-Tech Materials

High-Tech Materials

The 4TU Research Centre High-Tech Materials (4TU.HTM) aims to stimulate and intensify the academic research and development of new innovative materials.

Latest updates

Dutch Materials 2018

Dutch Materials 2018
This year the 4TU.HTM annual symposium will be held in Utrecht (Jaarbeurs, Beatrix building) on Friday 12 October 2018. Full...

Monday 26 February 2018

hightechmaterials.4tu.nl

4TU.High-Tech Materials search tool
The new 4TU.HTM web application [hightechmaterials.4tu.nl](https://t.co/0aN5NYEabf) makes it easy to find materials scientists and research groups...

Thursday 1 February 2018

4TU.HTM @Twitter

@4TU_HTM
Dutch Materials 2018 featuring speakers with chairs in Micro & Nano structures in Alloys @KTHuniversity, Theory & S...
<https://t.co/0aN5NYEabf>

4 days ago

Special Seminar Prof. Wong

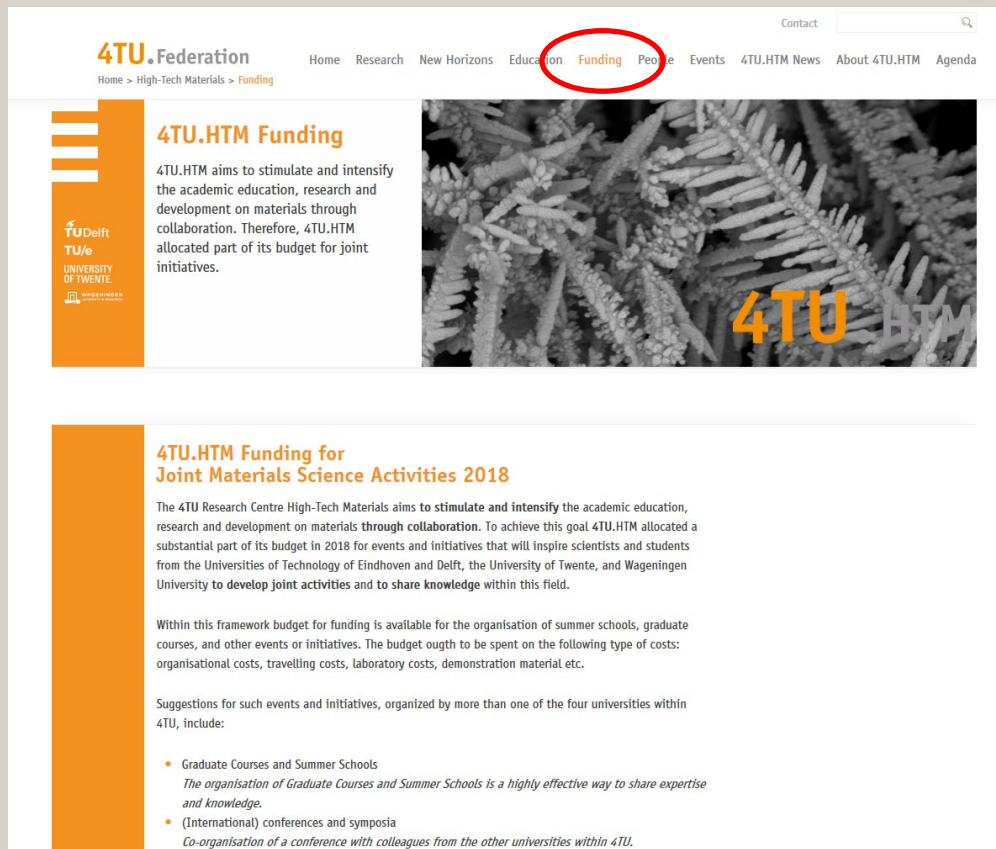
Innovative Materials (digital magazine)

4TU.HTM News on Twitter

4TU.HTM

FEEDBACK

website <http://www.4TU.nl/HTM>: Funding for collaboration



The screenshot shows the website's navigation menu with 'Funding' highlighted in a red circle. The main content area features a section titled '4TU.HTM Funding' with a description of its mission and a list of funding activities for 2018. The page includes logos for TU Delft, TU/e, and the University of Twente.

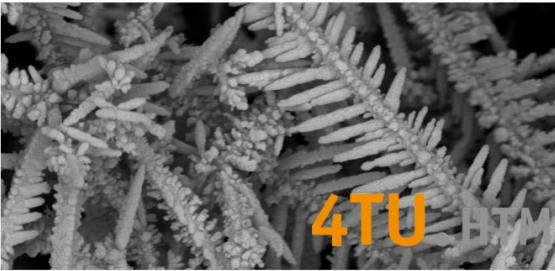
Contact

4TU Federation Home Research New Horizons Education **Funding** People Events 4TU.HTM News About 4TU.HTM Agenda

Home > High-Tech Materials > Funding

4TU.HTM Funding

4TU.HTM aims to stimulate and intensify the academic education, research and development on materials through collaboration. Therefore, 4TU.HTM allocated part of its budget for joint initiatives.



4TU.HTM Funding for Joint Materials Science Activities 2018

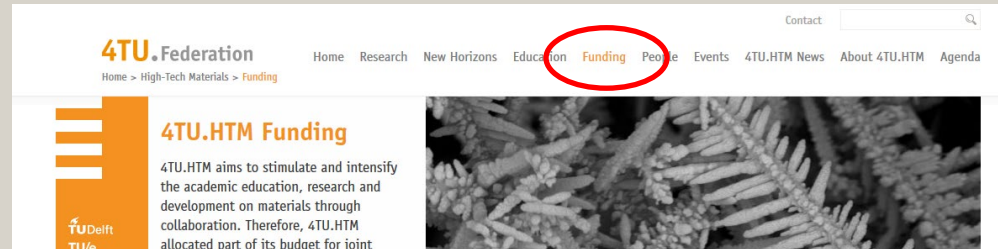
The 4TU Research Centre High-Tech Materials aims to **stimulate and intensify** the academic education, research and development on materials **through collaboration**. To achieve this goal 4TU.HTM allocated a substantial part of its budget in 2018 for events and initiatives that will inspire scientists and students from the Universities of Technology of Eindhoven and Delft, the University of Twente, and Wageningen University to **develop joint activities** and to **share knowledge** within this field.

Within this framework budget for funding is available for the organisation of summer schools, graduate courses, and other events or initiatives. The budget ought to be spent on the following type of costs: organisational costs, travelling costs, laboratory costs, demonstration material etc.

Suggestions for such events and initiatives, organized by more than one of the four universities within 4TU, include:

- Graduate Courses and Summer Schools
The organisation of Graduate Courses and Summer Schools is a highly effective way to share expertise and knowledge.
- (International) conferences and symposia
Co-organisation of a conference with colleagues from the other universities within 4TU.

website <http://www.4TU.nl/HTM>: Funding for collaboration



The screenshot shows the top navigation bar of the 4TU Federation website. The 'Funding' link is highlighted with a red circle. Below the navigation bar, the main content area features a section titled '4TU.HTM Funding' with a sub-header '4TU.HTM aims to stimulate and intensify the academic education, research and development on materials through collaboration. Therefore, 4TU.HTM allocated part of its budget for joint'.

to develop joint activities and to share knowledge

4TU.HTM Funding for Joint Materials Science Activities 2018

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Active community

- Organise joint activities
- Graduate Courses
- Draw attention to Materials Science and Engineering
- Development of demonstration material
-



Today: fourth 4TU.HTM symposium *Dutch Materials*

prof. Nicola Marzari (École Polytechnique Fédérale de Lausanne (EPFL))
Discovering novel materials: the convergence of high-performance computing, high-throughput computing, and data analytics

Haixing Fang, M.Sc. (Novel Aerospace Materials, TU Delft)
Direct view of self-healing in creep alloys

Coffee Break

prof. Annika Borgenstam (KTH Royal Institute of Technology, Stockholm)
On the development of theoretical and experimental tools for materials design of high strength steels and cemented carbides

dr. Carola Celada-Casero (Materials Science and Engineering, TU Delft)
Understanding microstructural changes for the design of advanced steels

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Coffee Break

prof. Jilt Sietsma (Materials Science and Engineering, TU Delft)
Nucleation of phases in metallic microstructures

dr. Carola Celada-Casero (Materials Science and Engineering, TU Delft)
Understanding microstructural changes for the design of advanced steels

After lunch, 13:30 – 15:00 h

New Horizons in Designer Materials

Amir Mirza Gheytaghi (TU Delft), *Superconducting Carbon Nanotubes composite as Vertical Interconnect for Qubit Integration at Cryogenic Temperature*

Matthew Hendrikx (TU/e), *Communicating Surfaces*

Mohammad Moradi (TU/e), *Structure formation in hierarchical hybrid materials through in situ liquid phase microscopy*

Maciek Kopeć (UTwente), *Towards Advanced, 3D Materials Bottom-Up, from Polymer Decorated Nano- and Microstructures*

Posters of all research projects

Coffee Break

dr. Sissi de Beer (Materials Science and Technology of Polymers, UTwente)
Wetting of polymer brushes by polymeric nanodroplets

dr. Ruben Higler (Physical Chemistry and Soft Matter, WUR)
Anomalous dynamics and phase behaviour of dopants in weak crystals

prof. Kurt Kremer (Max Planck Institute for Polymer Research)
Multiscale Modeling and Design of Smart Polymers

16:45 h: **Drinks**

4TU.HTM

4TU Research Centre High-Tech Materials (4TU.HTM)

- Strengthen collaboration between the four TU's
- Strengthen the research field Materials Science and Engineering
- Stimulate education in Materials Science and Engineering



Contact:

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Reina Boerrigter, R.Boerrigter@tudelft.nl

<http://www.4TU.nl/HTM>

