NANOMATERIALS FOR ENERGY

MESA+ INSTITUTE FOR NANOTECHNOLOGY

Energy projects within MESA+ research groups, February 2013

Strategic Research Orientation 'NanoMaterials for Energy'

Information: www.utwente.nl/mesaplus/nme/

Project title	*Group*	*PhD's/Postdoc*	*Supervisor*
Solar Fuels			
Photocatalytic Nanomaterials	IMS	Wouter Maijenburg	André ten Elshof
Tailored oxide nanoparticles for highly reactive hydroxyl species	CPM	Shilpa Agarwal	Barbara Mojet
Photocatalytic water splitting in microfluidic devices	MCS	Engin Karabudak	Han Gardeniers
Microfluidic solar-2-fuel devices with Si membranes as light-harvesting units	MCS / MnF	Rick Elbersen	Han Gardeniers / Jurriaan Huskens
Microfluidic behavior in solar-2-fuel devices	MnF	David Fernandez Rivas	Jurriaan Huskens
Solar-2-fuel by self-assembled nano/microrods	MnF	Janneke Veerbeek	Jurriaan Huskens
Visible-light induced water-splitting on a chip	NE / PCS / SRO	Michel Zoontjes	Wilfred v/d Wiel / Guido Mul / Mark Huijben
Understanding operation of functionalized Si structures for photon induced water splitting and CO_2 reduction	OS / PCS	Sun-Young Park	Jennifer Herek / Guido Mul
Tuning of functionalized mesoporous silicas for photocatalytic CO_2 reduction	PCS	M. Hamdy Saad	Guido Mul
Steering Electrons and holes in the right direction	PCS	Kasper Wenderich	Guido Mul
High pressure operation of CO2 electroreduction	PCS	Recep Kas	Guido Mul
Understanding the mechanism of water oxidation over oxide surfaces by time resolved IR spectroscopy	PCS	Rezvaneh Amrollahi	Guido Mul
Solar Cells			
Studying manufacturing techniques for organic solar cells	CBP	Gabriel Villalobos	Wim Briels
Contacts between p- and n-doped oxides	ICE	Marcel Hoek, Francesco Coneri	Hans Hilgenkamp
Growth of Cu_2ZnSnS_4 absorber layers by electrodeposition	ICE	Obaidul Islam	Hans Hilgenkamp
Photo-active nanostructured oxides for solar applications	IMS	Suresh Kumar	André ten Elshof
Novel Composite Oxides for Next Generation All-Oxide-Photovoltaics	IMS	Tom Wijnands	Mark Huijben
Dye-Synthesized Solar Cells	OS	Vac.	Annemarie Huyser
Growing a solar cell directly on a CMOS chip	SC	Jiwu Lu	A.Y. Kovalgin
Fuel Cells			
Thin film electrolyte manufacturing technology for SOFC	IMS	Sjoerd Veldhuis	André ten Elshof
Robust Ceramic Anodes for it-SOFC	IMS	Gerard Cadafalch i Gázquez	Bernard Boukamp
Oxygen surface exchange on oxide ion conductors	IM	Chung-Yul Yoo	Henny Bouwmeester
Lighting			
Light Scattering in white LEDs for efficient lighting	COPS	Sina Toru, Vanessa Leung	Willem Vos
Stirring of light!	COPS	Diana Grishina, Femi Ojambati	Willem Vos
Piezoelectrics			
Piezoelectric thin films for NEMS/MEMS energy harvesting devices	NEM	Xin Wan, Ruud Steenwelle, Matthijn Dekkers	Guus Rijnders
Thermoelectrics			
Efficient energy harvesting by nanostructured thermoelectric materials	IMS / SRO	Peter Brinks	Mark Huijben
Blue Energy			
Tailor made membranes for Blue Energy: salt/fresh water mixing	MST	Enver Guler	Kitty Nijmeijer
Microstructured membranes for Blue Energy: salt/fresh water mixing	MST	David Vermaas	Kitty Nijmeijer
Dynamics of double-layer charging in ionic liquids	NI	Vac.	Serge Lemay
Energy from streaming potential using nanotechnology	NLCA / BIOS	Yanbo Xie, Trieu Nguyen	Jan Eijkel / Albert van den Berg
Thermal Insulation			
Thermal insulation by nanostructured composite foam materials	MTP	…	Julius Vancso

CO_2 separation/capture

Membrane reactors for combustion with integrated CO_2 capture	IM	Wei Chen	Louis Winnubst
Polymer-MOF architectures for CO_2 separation	MST	Salman Shahid	Kitty Nijmeijer
Designer polymers for CO_2 capture	MST	Zeljka Madzarevic	Kitty Nijmeijer
Membrane reactor for CO_2 conversion into fuels	MST	Harro Mengers	Kitty Nijmeijer

Fossil Fuels

Rock-on-a-Chip: Micro- and Nanofluidics for Enhanced-Oil-Recovery • Electrostatically controlled self-assembly at solid-liquid interfaces • Ion-adsorption at solid-liquid interfaces • Oil-water two-phase flow in microfluidic channels: trapping and release of oil drops • Wetting transitions at solid-liquid-liquid three-phase systems • Interfacial adsorption and rheology at oil-water interfaces	PCF	Rielle de Ruiter, Bijoyendra Bera, Naveen Kumar, Lei Wang, Igor Siretanu, Chandra Murade	H.T.M. van den Ende, M.H.G. Duits, F. Mugele
Detection and guidance of nanoparticles for enhanced oil recovery	MSM	I. Güven	Stefan Luding

Related Projects:

Energy Efficient Electronics

Improved understanding of physical properties by computational materials science; such as graphene, oxide interfaces, 1D systems, spintronics and metal-organic interfaces.	CMS	……	Paul Kelly
Two-dimensional electronics in high-mobility oxide interfaces	ICE / IMS	Sander Wenderich, Peter Eerkes / Michelle Kruize, Hajo Molegraaf	Hans Hilgenkamp, Alexander Brinkman / Mark Huijben, Gertjan Koster, Guus Rijnders
Topological Insulators	QTM	Menno Veldhorst, Marieke Snelder, Denise Leusink	Hans Hilgenkamp, Alexander Brinkman
Ferroelectrics on CMOS	NEM	Vac.	Guus Rijnders
Spin quantum bits in silicon quantum dots	NE	Filipp Müller, Matthias Braun	Floris Zwanenburg
Electrical transport in low-dimensional nanostructures • Physical properties of 1D-nanowires • Electronic behavior of molecular layers	PIN	Rene Heimbuch, Ali Safaei, Kai Sotthewes, Avijit Kumar	Harold Zandvliet

Energy Efficient Processes

Electrode modifications for capacitive deionization on-chip	BIOS	Susan Roelofs, Mathieu Odijk	Albert van den Berg
Cleaning drinking water	CPM / SFI	Roger Brunet Espinosa	Leon Lefferts / Rob Lammertink
Oxicracking naphta	CPM	G. Raman	Leon Lefferts
Combined oxidative coupling and methane steamreforming	CPM	D.B. Thakur	Leon Lefferts
Selective oxidation ammonia	CPM	Chris Reed	Leon Lefferts
Nitrite hydrogenation	CPM	Koteswara Rao Nidadavolu, Yingnan Zhao	Leon Lefferts
Selective oxidation with electrical fields	CPM / MCS	Arturo Susarrey Arce	Leon Lefferts / Han Gardeniers
Hybrid membranes with enhanced hydrogen selectivity and hydrothermal stability	IM	Marcel ten Hove	Louis Winnubst
Mixed ionic-electronic conducting membrane reactors for syngas production	IM	Tan Phung	Henny Bouwmeester
Hybrid organic-inorganic membranes for gas separation	IM	Martin Wolf	Henny Bouwmeester
Microporous hybrid membranes and materials	IM / IMS	Hammad Qureshi / Rogier Besselink	Louis Winnubst / André ten Elshof
Polymer grafting of porous inorganic membranes	IM	Giri Sripathi	Nieck Benes
Mixed ionic-electronic conducting membranes for syngas generation	IM	Bas ten Donkelaar	Henny Bouwmeester
Superimposed effects of nanoscale confinement and penetrant on behavior of ultra-thin glassy polymer membranes	MST	Wojciech Ogieglo	Nieck Benes
Tailor made membranes for oil-water separations	MST	Jordi Moreno	Kitty Nijmeijer
Structure-property relationships in polymer membranes for olefin/paraffin separation	MST	Jeroen Ploegmakers	Kitty Nijmeijer

Meander Reactor	SFI	Elif Karatay	Rob Lammertink
Developing an ideal platform for adsorption	SFI	Vic van Dijk	Rob Lammertink
Understanding of physical properties of fluids and solids by multi-scale modeling • Micro- and nanofluidic flow in narrow channels • Multi-phase flow modeling through porous media on multiple scales	MSM	A.R. Thornton, V. Magnanimo, R. Hartkamp, K. Yazdchi, S. Srivastava	B. Todd, Stefan Luding
Nanoscale contact mechanics, adhesion, plasticity and energy dissipation	MSM	A. Singh, V. Magnanimo	Stefan Luding

MESA+ research groups

Information : www.utwente.nl/mesaplus/participating_research_groups/

Biomolecular Electronic Structure (BES), Claudia Filippi, S&T
Lab-on-a-chip (BIOS), Albert van den Berg, EEMCS
Biomolecular Nanotechnology (BNT), Jeroen Cornelissen, S&T
Computational BioPhysics (CBP), Wim Briels, S&T
Computational Materials Science (CMS), Paul Kelly, S&T
Complex Photonic Systems (COPS), Willem Vos S&T
Catalytic Processes and Materials (CPM), Leon Lefferts, S&T
Interfaces and Correlated Electron systems (ICE), Hans Hilgenkamp, S&T
Inorganic Membranes (IM), Arian Nijmeijer, S&T
Inorganic Materials Science (IMS), Dave Blank, S&T
Integrated Optical MicroSystems (IOMS), Markus Pollnau, EEMCS
Laser Physics and Nonlinear Optics (LPNO), Klaus Boller, S&T
Low Temperature Division (LT), Horst Rogalla, S&T
Mesoscale Chemical Systems (MCS), Han Gardeniers, S&T
Molecular Nanofabrication (MnF), Jurriaan Huskens, S&T
Multi Scale Mechanics (MSM), Stefan Luding, ET
Membrane Science and Technology (MST), Kitty Nijmeijer, S&T
Materials Science and Technology of Polymers (MTP), Julius Vancso, S&T
Numerical Analysis and Computational Mechanics (NACM), Jaap van der Vegt, EEMCS
NanoBioPhysics (NBP), Vinod Subramaniam, S&T
NanoElectronics (NE), Wilfred van de Wiel, EEMCS
NanoElectronic Materials (NEM), Guus Rijnders, S&T
NanoIonics (NI), Serge Lemay, S&T
Nanofluidics for Lab on a Chip Applications (NLCA), Jan Eijkel, EEMCS
Optical Sciences (OS), Jennifer Herek, S&T
Physics of Complex Fluids (PCF), Frieder Mugele, S&T
PhotoCatalytic Synthesis (PCS), Guido Mul, S&T
Physics of Interfaces and Nanomaterials(PIN), Harold Zandvliet, S&T
Physics of Fluids (POF), Detlef Lohse, S&T
Quantum Transport in Matter (QTM), Alexander Brinkman, S&T
Semiconductor Components (SC), Jurriaan Schmitz, EEMCS
Soft Matter, Fluidics and Interfaces (SFI), Rob Lammertink, S&T
Science, Technology, and Policy Studies (STePS), Stefan Kuhlman, MG
Transducers Science and Technology (TST), Miko Elwenspoek, EEMCS

SRO : Strategic Research Orientation 'NanoMaterials for Energy', Mark Huijben

Faculties: EEMCS = Electrical Engineering, Mathematics and Computer Science; ET = Engineering Technology; S&T = Science and Technology; MG = Management and Governance.