SCIENTIFIC AND METHOD MODULES

Module name	From Molecules to Materials
Number	2016-T4
Aims	This module links molecular sciences and materials science, teaches how materials with optimized catalytic activity and adjustable magnetic, electronic, or optical properties are obtained from molecules, and provides an understanding of the properties and applications of these materials.
Basics	covered in basic modules B1–B3 (molecular precursors, supramolecular chemistry, polymers, organic and inorganic nanostructures) and MOFs covered in the module “Smart Molecules” (T1)
Contents	Materials from “hard” (synthetic molecules, crystalline nanostructures, quantum-electronic structures) building blocks and/or “soft” (polymers, biomolecules, MOFs, metal-binding peptides, thin films) building blocks, Supramolecular arrangements (proteins and peptides together with modifications to improve the material qualities [pegylation, lipidation, glycosylation]), Properties of these materials (magnetic, electronic, and optical properties, electronic, photonic, and magnetoresistive devices, superconductivity), Applications (catalysis [immobilised catalysts, MOFs], gas separation or gas storage [MOFs], sensors in electronics and photonics, quantum information technology [spintronics], energy conversion [including solar energy]), Theory (structure and interfaces within systems containing complex nano-aggregates), Atomistic particle transport through MOFs.
Methods	Immobilisation techniques, Deposition (chemical vapour deposition [CVD, PECVD, MOVPE], physical deposition [PLD], atomic layer deposition [ALD]), Surface analysis (MIES), Device characterization (e.g. I–V, C–V, S-Parameter), Modelling (mesoscale simulations, classical molecular dynamics simulations, multi-scalar approach, QM/MM simulations, advanced Monte Carlo techniques).
Type	Two-day block course/ bi-yearly recurrence with modification
Date (month/year)	19/20 September 2016
Time	10:00-19:00; 10:00-15:20
Work load	15 hours presence/ 45 hours self-study
Examination	Poster presentation about a self-chosen topic about “Artificial molecules and solid state crystals” (own research or from literature) and discussion (oral) in front of the poster with the organizer(s)
Credit points	2
Responsible scientists	Prof. Jan Meijer, Prof. Pablo Esquinazi
International guest lecturers	J. M. van Ruitenbeek (Leiden University, Netherlands), P. Olivero (University of Torino, Italy)
Industrial partners	
Recommendations for literature, e-learning	J.-M. Spaeth, H. Overhof: ”Point Defects in Semiconductors and Insulators”; Susan Shannon (Editor): “Trends in Quantum Computing Research”; M.A. Mielsen and I. L.Chuang: “Quantum Computation and Quantum Information”

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SCHEDULE for Module 2016-T4

Time	Lecturer	Programme	Location
Day 1			
Day 2			

Didactic elements:
Lecture, discussions, practical training – lab demonstration, etc.

Expected performance:
Active participation in discussions during lab demonstration etc.