'Science and technology of UV-induced polymerization'
Doctoral Program in Materials Science and Engineering

January 29-31, 2020
Room DIA004, EPFL, Lausanne

Lecturers:

- Dr. Yves Leterrier (LPAC-IMX-EPFL; organizer and contact person yves.leterrier@epfl.ch)
- Dr. Sara Dalle Vacche (Politecnico Torino)
- Prof. Marco Sangermano (Politecnico Torino)
- Dr. Eric Nouzille (Sicpa SA)

Program:

Wednesday Jan 29, 2020

14h15-15h00	Introduction to radiation processing (MS, YL)
15h15-16h00	Fundamentals (MS)
16h15-17h00	Components of photocurable formulations: photoinitiators, monomers, additives (MS)

Thursday Jan 30, 2020

9h15-12h00	Analytical methods: state of the art and new developments (SDV)
14h15-16h00	Laboratory demonstration of UV methods and processes (YL)

Friday Jan 31, 2020

9h15-11h00	Structure-property relations in UV curable polymers (YL)
11h15-12h00	Advances in UV-induced polymerization research 1 (MS)
14h15-15h00	Advances in UV-induced polymerization research 2 (SDV)
15h15-16h00	Application to surfaces, nanostructures and devices (YL)
16h15-17h00	UV inks and coatings (EN)

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Exam:

The course provides 1 ECTS, based on a written report (maximum 10 pages) on a topic relevant to UV polymers. The report should synthesize three technical papers A, B and C from open scientific literature and develop a short case study (for example using equation from paper A and data from paper B to model results from paper C, or designing a process method (formulation, UV intensity, time) using inputs from the 3 papers).

The following topics are proposed. Other topics are welcome.

- Free-radical vs cationic UV systems: mechanisms, drawbacks and benefits
- Humidity effect on cationic UV curing
- Oxygen effects on free-radical cure
- Analytical methods: state of the art, limitations and future developments
- Analysis and modeling of process induced stresses in UV coatings
- Hybrid UV-cured organic-inorganic coatings
- UV-curable nanocomposites: formulations and applications
- Process equipment for micro/nano structuring using UV polymers
- 3D printing based on photopolymerization: applications, benefits and limitations
- Comparison of thermal NIL (nano imprinting lithography) and UV NIL
- UV-curing applications in automotive industry
- Process technologies for UV inks
- …

Deadlines:

- selection of project (1 student / topic): Jan 30, 2020
- report (pdf) by email to yves.leterrier@epfl.ch: Feb 28, 2020