

# C'Nano 2020

The Nanoscience Meeting

## TOULOUSE

Centre des congrès Pierre Baudis

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**First Name, Family Name: Suzanne Giasson**

Title & employer: Professor, Université de Montréal

Laboratory Name: Dynamics and Engineering of Molecular Interfaces Laboratory

Address: Montréal, Québec, Canada

Website: <https://bit.ly/315fvgr> or <https://bit.ly/3145GPN>

Email: [suzanne.giasson@umontreal.ca](mailto:suzanne.giasson@umontreal.ca)

### CV/ biography

Suzanne Giasson has an academic background in Chemical Engineering and Materials Science from Université Laval, Canada (B.Sc and M.Sc.), Western University, Canada (PhD), UPMC, France (PhD) and UCSB, USA (Postdoc). She started her academic career at Université Laval in 1995 and joined the Université de Montréal in 2002 where she actually holds a joint position in the Chemistry Department and the Faculty of Pharmacy as full professor. She setup a laboratory which is currently equipped with two state-of-the-art Surface Forces Apparatus developed by Pr. Israelachvili. Prof. Giasson's current research program is on the development and investigation of responsive micro/nano-structured surfaces and coatings whose physical properties and surface chemistry can be tuned reversibly. The hierarchical structures are obtained by approaches using surface chemistry, polymer sciences and self-assembly. Such responsive nanostructured materials enable significant advances in biomedical surface engineering and microfluidics.

### Multi-Responsive Two-Dimensional Microgel Arrays as Coatings for Independent and Specific Control of Surface Properties

**Abstract** (max. 2300 characters incl. references and illustrations and counting the word space as a character)

Stimuli-responsive polymer coatings enable surface properties to be tuned by external stimuli (i.e. variations of environmental conditions) via changes in their physical conformation, surface chemistry, or both. This capacity enables their use as functional elements in nanotechnologies such as valves in microfluidic devices, as membranes in biomedical engineering, as substrates for culture of biological tissues or substrates of low friction. However, such coatings usually suffer from major shortcomings such as lack of selectivity and poor environmental stability. The talk will present a new generation of multi-responsive hierarchical and hybrid coatings aiming to overcome some of these limitations. A hierarchical polymer coating, consisting of two-dimensional thermo-responsive poly-(N-isopropylacrylamide) (PNIPAM) microgel arrays and surface-functionalized with non-responsive or pH-responsive polymers, was developed in order to tune independently the surface chemistry and the swelling behavior of the coating using different stimuli. The talk will report results showing how the characteristic dimensions (i.e. layer thickness) can indeed be controlled without affecting the surface properties (i.e. adhesion) of the functionalized microgel arrays. Another multi-responsive coating, made of hybrid microgels incorporating plasmonic gold nanoparticles (AuNPs) in PNIPAM microgels, was developed to tune the swelling behavior of thermo-responsive microgels using light. Unprecedented quantitative responsiveness of these immobilized hybrid microgel layers as a function of the temperature and irradiation will be presented. The responsiveness of both hierarchical and hybrid coatings was investigated using the Surface Forces Apparatus allowing adhesion, friction and layer thickness to be accurately determined under different stimuli.

**Keywords:** stimuli responsive materials, polymers, hydrogel, surface forces, adhesion, swelling, coatings.