DESIGN OF POLYMER NANOREACTORS WITH TRIGGERED ACTIVITY

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An efficient way to overcome many of today's challenges in domains such as medicine, food science, catalysis, and environmental sciences is to design and use nanoreactors as protected reaction spaces for active compounds (enzymes, proteins, mimics) encapsulated/inserted in supramolecular polymer assemblies (micelles, spheres, vesicles).[1,2] The **overall aim** of this PhD project is to develop triggered polymer nanoreactors by encapsulating/co-encapsulating enzymes and inserting channel proteins in polymer vesicles with sizes in the nanometer range. The triggered function is introduced by channel proteins that are modified so as to be open only in the presence of a specific chemical stimulus ("protein gate"). We will develop two types of nanoreactors intended to serve for: i. sensitive biosensing of pH changes, and ii. simultaneous detoxification of superoxide radicals and triggered production and release of compounds. The interactions of nanoreactors with biological systems[3] will be tested with human liver carcinoma cell line HepG2 in terms of cellular binding, uptake and intracellular processing in order to support their further medical application.

As the project is interdisciplinary, we are looking for candidates with good background in chemistry (especially physical chemistry or polymer chemistry), and biochemistry, and who are keen to perform challenging experiments involving the development of nanodevices and assess their interactions with cells for medical applications.

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