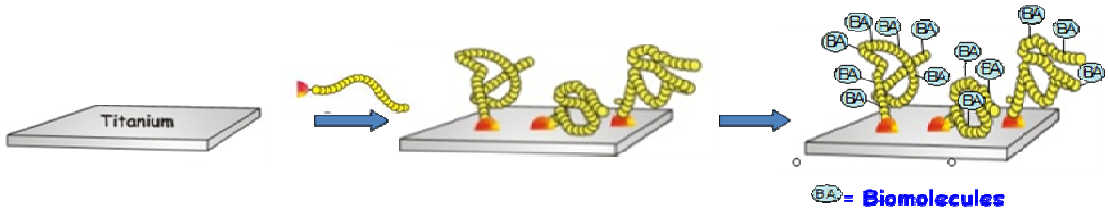
Subject Proposal for Erasmus Students in Chemistry

"Elaboration of stimuli-responsive biomaterials"

For a long time, in the field of implantable medical devices, the strategy was based on the organ replacement by inert biomaterials. Nowadays, the newly developed and most promising strategy consists of "smart" biomaterials specifically adapted to the implantation location in order to eradicate any complications which would lead to the death of the patient. The introduction of "active" prosthesis incorporating specific drugs would seem to be the best solution to struggle against these complications. This proposal for an Erasmus training course aims to develop new titanium based biomaterials incorporating well-defined stimuli-responsive polymers bearing specific drugs.



The first part of the work will be focused on the synthesis of "on-demand" clickable (bearing functional groups such as azide, alkyne, furane, maleimide,…) monomers. Thereafter, thanks to Controlled Radical Polymerizations such as Reversible Addition-Fragmentation Chain Transfer (RAFT) process, well-defined polymers will be synthesized with clickable groups located along the backbone and a specific functional group at the extremity of the polymer (anchor group) via the use of a judicious chain transfer agent. The clickable groups will be reacted with the complementary reactant (Click Chemistry), allowing the grafting of biological molecules such as specific carbohydrates. A complete characterization procedure of obtained polymers will be performed (FT-IR, Gel Permeation Chromatography, NMR, Maldi-TOF MS,…). The second objective will be the anchorage of the biological polymer to the surface and a special attention will be paid to the characterization of the supported polymer using different innovative techniques (Surface Plasmon Resonance, Electrochemical Quartz Crystal Microbalance, XPS, ….)

Keywords: Biomaterials, Synthesis, Polymerization

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