



Subject Proposal for Exchange Students in Chemistry (Master Level)  
(6 months, at any time of the year)

### **Setting up of active antimicrobial polymeric materials**

Antimicrobial active materials can be the next generation of food packaging. These innovative materials could play a role in extending shelf-life of foods and reduce the risk from pathogens. They can be achieved by adsorbing or incorporating antimicrobials into the packaging. However, the main challenge remains the gradual release of an antimicrobial from a packaging film to the food surface. Films with low diffusion rates are desirable since they maintain higher surface concentrations of antimicrobials for longer periods. In order to achieve this, the use of multilayer films can be an appropriate solution. Polymer layers such as polyacrylates will be deposited on the surface of low density polyethylene (LDPE), a commonly used packaging in the food sector. The formed layers will act as a matrix containing the active agent and releasing it in a controlled manner into the food surface. Nisin, an antilisterial bacteriocin, produced by *Lactococcus lactis* subsp. *lactis*, will be used as the antimicrobial peptide.

This work objectives will consist in optimizing the conditions needed for the used polymerization process (UV conditions, plasma parameters, type of monomers, degree of polymerization, layer thickness...). In a second step the kinetics of peptide release from the films and the antimicrobial activity of the functionalized materials will be determined.

The surface characterization of the samples will be done using appropriate techniques (SEM, DSC, NMR, FTIR, XPS, contact angle, surface energy...). The kinetics release and the antimicrobial activity will be investigated using protocols previously developed in our laboratory. The student will get a multidisciplinary training in a growing area of material science.

**Key Words:** Antimicrobial packaging, nisin, polymerization, surface characterization techniques

#### **Profile of candidates:**

The candidate should have a chemistry background. Basic knowledge in microbiology would be also appreciated.

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