# PhD position in polymer chemistry

**Title** : Development of peptide-polymer bioconjugates for therapeutic gene delivery

**Laboratory** : Le Mans Université, Institut des Molécules et Matériaux du Mans (IMMM CNRS 6293)
**Supervision** : Sagrario Pascual, Sandie Piogé et Laurent Fontaine
**Funding** : Le Mans Université from october 2021 to september 2024

**Context and description of the proposal**.
Currently, there is a multitude of synthetic gene transfer vectors based on cationic polymers. These vectors are able to electrostatically interact with anionic phosphates in DNA or RNA. In comparison with viral vectors, the advantages of such synthetic vectors are numerous: not immunogenic, their production and manipulation are simple. These polymers nevertheless have a drawback linked to their limited transfection efficiency. The challenge of synthetic vectors is therefore to overcome this limitation. This thesis project proposes to remove this scientific barrier by designing a multi-functional cationic polymer with key structural parameters allowing it to resist extracellular media, to target cells and to efficiently release the therapeutic gene. The parameters considered are the PEGylation of a cationic polymer to improve its resistance in the extracellular environment and the simultaneous anchoring of several peptides. The peptides considered are: recognition ligands (RL) for cell adhesion, cell penetrating peptides (CPP) to promote intracellular transport and nuclear localization signal peptides (NLS) to enhance nuclear accumulation. The objective of this project is to develop an original synthetic approach combining (i) reversible addition-fragmentation chain transfer (RAFT) polymerization to access varied and controlled architectures and (ii) azlactone chemistry for the bioconjugation of RL, CPP and NLS peptides.

**Profile**: The candidate must hold a Master's degree in Chemistry and / or Chemical Engineer. In order to successfully complete this 3-year project, the candidate must be rigorous, motivated, endowed with good communication skills, perseverance and critical thinking. Good knowledge in organic chemistry, macromolecular chemistry and in polymer characterization (NMR, FT-IR, SEC, ...) will be appreciated.

**Application :** To apply, please send a CV, a cover letter explaining why you wish to work on this project, master's or engineering scores (and any recommendations) to sagrario.pascual@univ-lemans.fr.