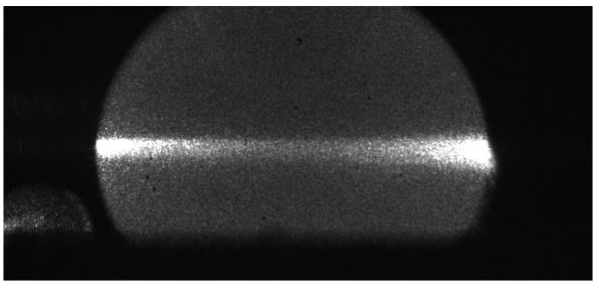
PhD position / CATCHY

How lignocellulolytic enzymes diffuse and propagate into their substrates? An approach combining physics and enzymatic engineering

Objectives. The framework of this PhD is the enzymatic deconstruction of lignocellulosic biomass to produce (bio)molecules of high interest. The fundamental objective of the work is to understand the physical mechanisms that are involved in the degradation and in the propagation of the enzymes in the structures they degrade. For that purpose, we plan to characterize the enzyme's action on a simplified polymeric substrate (a gel) *in-situ* and in real-time using two complementary techniques: (i) fluorescence microscopy for following the diffusion of fluorescently labeled enzymes in the gel, (ii) an innovative dynamic light scattering (DLS) technique that measures the dynamics of the polymer chains during the degradation of a millimetric gel bead, with high spatial resolution (see Figure).



The PhD work involves the controlled synthesis and characterization of lignocellulosic gel beads with adjustable structural and mechanical properties, the production and engineering of the enzymes of interest, the coupled characterization of the diffusion and the action of the enzymes using fluorescence microscopy and DLS.

Context. The research work will take place in the three laboratories L2C, TBI et IATE, under the joint direction of Laurence Ramos (L2C) and Antoine Bouchoux (TBI), and the co-supervision of Carole Assor (IATE). The main localization will be Montpellier, with regular visits in Toulouse. The L2C has a recognized expertise in soft matter physics, IATE brings its knowledge of the physical and chemical properties of the biopolymers involved, while TBI has the expertise in enzyme engineering and protein/biopolymer physical chemistry.

Expected profile and skills. Highly motivated candidate with a master's degree in physics or physical chemistry. Skills in soft matter, polymer physics and/or enzyme engineering are a plus.

Starting date. First trimester 2023
Deadline for application. December 1st 2022
Important. We currently have the funding for half of the PhD salary. The starting date above may change depending on the administrative constraints of the co-funding.

To apply. Send a CV, a cover letter and two references to Laurence Ramos laurence.ramos@umontpellier.fr and Antoine Bouchoux antoine.bouchoux@insa-toulouse.fr.