# Position Offered: UNIVERSITY GRADUATE

## Project: *Design of the viscoelastic properties of artificial tears by combining experiments, high-performance computing, and artificial intelligence*

**Technological and scientific fields:** Artificial Intelligence, Big Data Processing and Information Technologies, High-Performance Computing, and New Materials

**Location:** Madrid, Madrid, Instituto de Estructura de la Materia, www.iem.csic.es

**Research Group/PI:** Biophym, Javier Ramos, www.biophym.iem.csic.es

## PROJECT SUMMARY

This project addresses the study of the viscoelastic properties in biopolymeric solutions with the main objective of advancing the design of artificial tears through a multidimensional approach. The space between the cornea and the eyelid is extremely narrow, and during blinking, a high shear rate is created over the corneal surface. This rapid movement generates large mechanical forces on the tear film. Therefore, the viscoelastic properties of tears play an essential role in responding to these shear forces.

The main objective of this project is to use high-performance computer simulations (HPC) and artificial intelligence (AI) algorithms, primarily machine learning, to identify the factors that are important in the viscoelasticity of tears as a design parameter for eye drops. The data needed to train and test the AI will be obtained by the research groups to which the PIs belong, using advanced experimental techniques in macromolecular characterization, such as rheology, microrheology, and microfluidics. Generally, artificial tears are aqueous solutions with an agent that controls viscosity and with behavior that attempts to emulate natural tears. In this regard, the viscoelastic properties of biopolymeric solutions based on soluble polysaccharides and lipids, possible candidates for the design of artificial tears to treat certain eye diseases such as dry eye disease, will be explored.

## PROFESSIONAL PROFILE

### Minimum requirements:

Required Qualifications: Bachelor's and Master's Degree in the Area of Sciences
Minimum demonstrable English level B2

### Merits to be considered:

Experience with HPC facilities
Professional experience in material modeling
Knowledge of Python programming
Knowledge of Linux and bash scripting in Linux
Knowledge in the use of molecular modeling programs (GROMACS, Gaussian, VMD)

## WHAT IS OFFERED

The project provides an excellent training opportunity in the fields of high-performance computing and artificial intelligence, both of which are of great importance in today's society. There is the possibility to pursue a Master's in Artificial Intelligence as well as the opportunity to collaborate with researchers in the development of AI for the design of new materials.

### Contract conditions:

Indefinite contract for a University Graduate associated with the Momentum Project of 4 years' duration according to Spanish science law. Gross annual salary (37.000 € - 41.000 €).

### Start of contract: before 31 December 2024

## PRINCIPAL INVESTIGATOR CONTACT

Email: j.ramos@csic.es
Phone: +34616794809