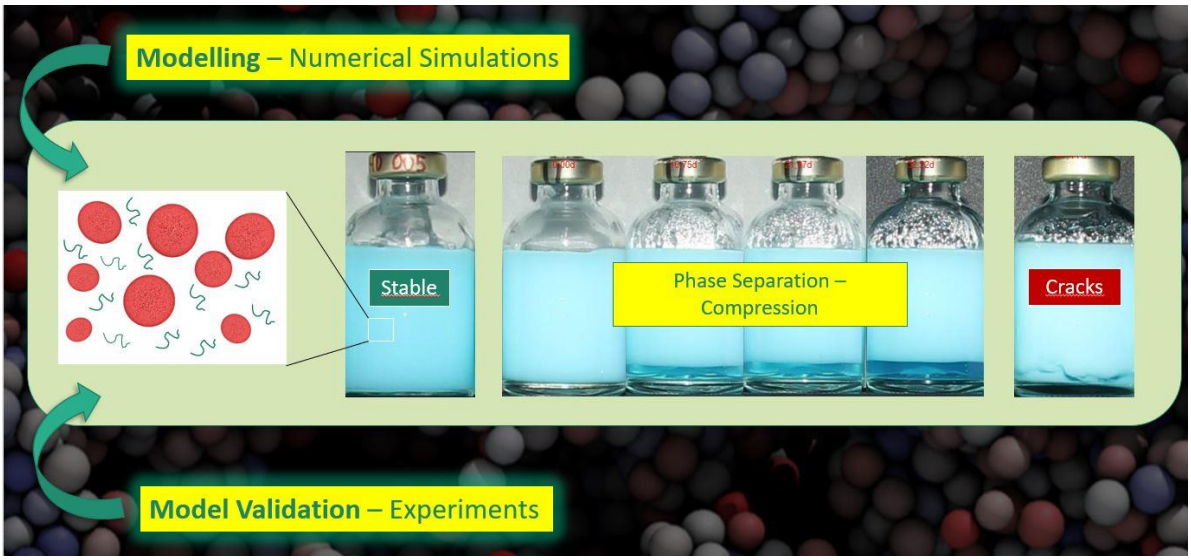
Modeling gravitational collapse and phase separation of yield-stress fluids

Nikolaos Kolezakis – Advisor: Prof. Gaetano D' Avino

Curriculum: Ingegneria Chimica

The research project aims at studying the phase separation and gravitational collapse over aging of yield-stress fluids of interest for home-care companies. Many formulated products are made of colloidal gels that own their physical stability to the presence of a yield stress. A yield stress is often achieved by mixing colloidal particles and soluble polymers to achieve a so-called depletion gel that has a yield stress thanks to the excluded volume forces generated by interaction between colloidal particles and soluble polymers. These gels have a very low yield stress and can phase separate under gravity. The purpose of the present project is to study phase separation and gravitational collapse of a depletion gel. The gel is made of bilayer vesicles with size between 100 nanometers and 2 microns suspended in polymeric solution. The work will be carried out by modeling and numerical simulations. The objective of the project is to investigate the interplay between physical stability rheology and microstructure. Specifically, the major accomplishments expected are: i) definition of a modeling framework to predict the stability of polymeric solutions of colloidal gels, ii) validate the model against data provided by experiments, iii) use the developed model to predict phase separation and gravitational collapse of colloidal gel suspensions by varying the operating conditions and rheological parameters.



Nikolaos Kolezakis, PhD student XXXVII cycle, July 2022