

# Drying of Pickering emulsions and destabilization mechanisms

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This PhD position is with Prof. Erin Koos and Deniz Gunes, within the Soft Matter, Rheology and Technology section of the Department of Chemical Engineering (<https://cit.kuleuven.be/smart/>).

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## Project

Pickering emulsions are a class of three-component soft matter: solid particles stabilize the interface between two liquid phases. Many materials, ranging from porous ceramics to low-fat foods, are formed from these particle-stabilized (Pickering) emulsions. As these materials dry, however, the structures can destabilize, resulting in the collapse of the structure (densification in ceramics or oil leakage in foods).

The goal of this project is to use a combination of methods, ranging from imaging to film stress measurements to study the structure evolution of drying droplets and films made from these droplets. We would therefore like to relate drying conditions in addition to the properties of the stabilizing particles to emulsion collapse. Two systems will be of interest. First, Pickering emulsion droplets made from inorganic silica particles will be used to investigate the properties of the contact angle and interparticle forces. Second, natural particles (e.g. starch) with complex composition will be used as a pathway towards applications in the food industry.

Film stress measurements using the cantilever deflection method are able to measure the overall stress in a film during drying. Our custom-built stress measurement apparatus uses the cantilever deflection method to determine stresses within the tape cast film. The cantilever fixture is suspended from an analytical balance, which makes the drying rate of the same film accessible in a simultaneous measurement. This apparatus allows us to directly compare the stress in the film with the solvent evaporation rate to determine the cause of a stress rise and mechanistically link the cracking or particle mobility to the drying conditions.

Key tasks:

- Characterize the mechanical properties of the Pickering emulsions using a combination of imaging techniques (e.g. confocal microscopy and SEM) and rheology with a focus on the resistance of the droplet breakup and coalescence in flow.
- Improve the simultaneous stress and weight measurements to limit assumptions and best simulate bulk drying conditions.
- Examine the drying of model Pickering emulsions made with inorganic nanoparticles and compare these to those made with natural, food-grade ingredients.
- Determine the role of particle softness on the drying behavior.

## Profile

Are you an energetic person, able to both think critically and creatively in scientific terms while also being effective at resolving technical challenges? Are you keen on working at the crossroads of several disciplines (from chemical engineering to biomedicine)? Then you may be the perfect scientist to join our team.

The ideal candidate will possess the following skill set:

- Candidates should have recently obtained a Master's degree in Chemical Engineering, Materials Science or Materials Engineering with outstanding grades.
- Candidates should have a strong experimental and theoretical background in colloids, emulsions and/or rheology.
- Language skills: ENGLISH: Excellent; DUTCH: of advantage for the interaction within the University, however not required.
- Candidates have to be hardworking, enthusiastic and intelligent with a strong interest in understanding the fundamentals of materials behavior, as well as its implications for engineering applications.
- You have a talent for conceiving advanced experimental set-ups and can realize them in a target-oriented manner.
- You must have less than 4 years of research experience, i.e., you should be an early-stage researcher.

## Offer

- We offer a full-time PhD or Postdoctoral position for 1 year. After a positive evaluation, the contract can be extended to 3 additional years (4 years in total).
- Excellent guidance by our young, dynamic and multidisciplinary team.
- State of the art research infrastructure.
- A challenging job in a young, dynamic environment
- High level scientific training at a top-ranked university
- Remuneration according to the KU Leuven salary scales: <https://www.kuleuven.be/english/research/associatienet/phd>

Ideal start time is October 1st 2022, but earlier and later starting dates can be negotiated.

## Interested?

For more information please contact Prof. dr. Erin Koos, tel.: +32 16 37 63 47, mail: erin.koos@kuleuven.be or Prof. dr. ir. Deniz Gunes, mail:deniz.gunes@kuleuven.be.

Applications must contain:

- An up-to-date CV, detailing work experience and research and academic achievements
- A cover letter describing the candidate's motivation for the fellowship
- At least two reference letters from a (former)supervisor, professor or a manager with contact information.
- Scanned copy of the degree (usually the master's degree) which would formally entitle the candidate to embark on a doctorate. If the degree has not been obtained yet, the applicant will have to ensure that the date of graduation will be earlier than the start date of the contract.
- Transcript of records (applicant's ranking and marks) for both Bachelor degree and Master degree. In case the applicant has not obtained their Master degree yet, a copy of the most recent Master grades should be provided
- A copy of an identity document.

You can apply for this job no later than September 30, 2022 via the online application tool (Bij publicatie komt hier automatisch de link naar de online sollicitatiepagina.)

KU Leuven seeks to foster an environment where all talents can flourish, regardless of gender, age, cultural background, nationality or impairments. If you have any questions relating to accessibility or support, please contact us at [diversiteit.HR@kuleuven.be](mailto:diversiteit.HR@kuleuven.be).