

Research Role Profile

<b>Job Title:</b>	Research Fellow (1A)
-------------------	----------------------

<b>Responsible to:</b>	Head of research group, or principal investigator
------------------------	---

<b>Responsible for:</b>	Not applicable
-------------------------	----------------

<b>Job Summary and Purpose:</b>
To undertake research in accordance with the specified research project(s) under the supervision of the principal investigator.

<b>Main Responsibilities/Activities</b>
<p>To undertake a range of research activities within a specified research area, assuming responsibility for specific areas of projects and making use of new research techniques and methods, in consultation with the research award holder or supervisor. This may include fieldwork, interviews, laboratory experimentation, critical evaluation and interpretation, computer-based data analysis and evaluation or library research.</p> <p>Using initiative and creativity to identify areas for research develop new research methods and extend the research portfolio. Analysing and interpreting results of own research. Write up results and prepare papers for submission to appropriate journals and conferences, and other outputs as required and/or appropriate. Attend appropriate conferences for the purpose of disseminating research results of personal development. The post holder may also contribute to writing bids for research grants and will contribute to collaborative decision making with colleagues in areas of research.</p> <p>Continually to update knowledge and develop skills, and translate knowledge of advances in the area into research activity.</p> <p>To plan and manage own research activity in collaboration with others. To carry out administrative tasks associated with specified research funding, for example risk assessment of research activities, organisation of project meetings and documentation. Implementation of procedures required to ensure accurate and timely formal reporting and financial control.</p> <p>To contribute to teaching in the Faculty by carrying out student supervision and/or demonstrating within the post holder's area of expertise and under the direct guidance of a member of departmental academic staff, as appropriate.</p> <p>The post holder may occasionally be required to supervise more junior research staff.</p>

## Research Role Profile

### Person Specification

#### The post holder must have:

A doctoral degree in a relevant discipline (although individuals who have almost completed a doctoral degree may be appointed). Consideration may also be given to individuals who do not hold a doctoral degree but have required skills based on a number of years experience in specified / relevant fields.

The post holder will have authority over some aspects of project work and must be capable of providing academic judgement, offering original and creative thoughts and be able to interpret and analyse results.

### Relationships and Contacts

Direct responsibility to the principal investigator or academic supervisor. The post holder may be asked to serve on a relevant Faculty committee. There may be additional reporting and liaison responsibilities to external funding bodies or sponsors. The post holder may work on original research tasks with colleagues in other institutions.

### Special Requirements

To be available to participate in fieldwork as required by the specified research project

#### All staff are expected to:

- Positively support equality of opportunity and equity of treatment to colleagues and students in accordance with the University of Surrey Equal Opportunities policy.
- Help maintain a safe working environment by:
  - Attending training in Health and Safety requirements as necessary, both on appointment and as changes in duties and techniques demand
  - Following local codes of safe working practices and the University of Surrey Health and Safety Policy
- Undertake such other duties within the scope of the post as may be requested by your Manager.

## Research Role Profile

## Addendum to Role Profile

<b>Job Title:</b>	Postdoctoral Research Fellow on DEM-CFD modelling of hydration of hydrocolloids (Post 1)
-------------------	--

**Job Summary and Purpose**

Funded by EPSRC and in collaboration with world-leading experts at the Universities of Birmingham and Swansea, we are recruiting TWO full-time postdoctoral research fellows to work on multiscale modelling of dispersion and dissolution of hydrocolloids in the School of Chemistry and Chemical Engineering at the University of Surrey. The position holders will work with an internationally renowned supervisory team with expertise in theoretical, computational and experimental methods for complex multiphase fluids and granular materials at the universities of Surrey, Birmingham and Swansea.

Hydrocolloids (HCs) are functional ingredients widely used for modifying the rheology, texture, microstructure, water activity, shelf life, release property and organoleptic properties of foods, pharmaceuticals, and fine chemicals. Effective dispersion and hydration of hydrocolloids are critical process steps for achieving the desired rested states and functionality. However, complex dynamic processes are involved during hydrocolloid hydration including wetting, swelling, dispersion and dissolution. A thorough understanding of the physicochemical interactions of HCs with solvents and the dispersion process at a multiscale is hence essential. *The goal of the collaborative project is to develop advanced modelling techniques for a wide range of HC particles so that dispersion of HCs can be optimised to promote rapid dissolution in order to avoid the formation of slowly dissolving aggregates.*

**Main Responsibilities/Activities**

The research fellow is expected to work closely with other researchers and collaborators on this project to model the hydration behaviour and kinematics of HC particles in a controlled hydrodynamic field using DEM coupled with CFD (DEM-CFD), or other numerical techniques, that accounts for the wetting, swelling, rupture, gelation and particle-particle interactions of hydrated HC particles including aggregation. This also involves validation of the developed numerical models using the experimental data provided by collaborators or reported in literature. In addition, the PDRF will also develop numerical models to predict the time evolution of the size distribution of hydrated/swollen/ruptured HC particles in typical dispersion and mixing processes relevant to industrial applications. Specific activities may involve but not limited to

- 1) Adapt an in-house coupled discrete element method with computational fluid dynamics (DEM-CFD) code by incorporating hydration contact models;
- 3) Validate the modified hybrid code with experimental data;

## Research Role Profile

- 4) Model dispersion of hydrocolloids using the developed hybrid models, including sensitivity analysis and optimisation;
- 5) Perform data analysis, write technical report and papers, disseminate research outcome at national and international conferences;
- 6) Supervise postgraduate and undergraduate research projects;

### **Person Specification**

The post holder must have a strong numerical background with proficient computer programming skills (E), a good track record in research publication and code development (E), some experience in developing DEM, DEM-CFD or similar models (E), and a good knowledge of high performance computing techniques (D). It is also expected that the PDRF has a high level of research ability and independence, and team-working skills to interact with other researchers, industry and the international academic partners (E). Previous experience in the development and application of numerical models in particle dispersion will be desirable but not essential.

### **Special Requirements**

This project involves collaborations with UK universities and industrial partners, a good team work skill is also essential.

### **Relationships and Contacts**

Direct responsibility to the principal investigator or academic supervisor. The post holder may be asked to serve on a relevant Faculty committee. There may be additional reporting and liaison responsibilities to external funding bodies or sponsors. The post holder will work on original research tasks with colleagues in other institutions.

## Research Role Profile

<b>Job Title:</b>	Postdoctoral Research Fellow on multi-physics modelling of hydrocolloid hydration (Post 2)
-------------------	--

**Job Summary and Purpose**

Funded by EPSRC and in collaboration with world-leading experts at the Universities of Birmingham and Swansea, we are recruiting TWO full-time postdoctoral research fellows to work on multiscale modelling of dispersion and dissolution of hydrocolloids in the School of Chemistry and Chemical Engineering at the University of Surrey. The position holders will work with an internationally renowned supervisory team with expertise in theoretical, computational and experimental methods for complex multiphase fluids and granular materials at the universities of Surrey, Birmingham and Swansea.

Hydrocolloids (HCs) are functional ingredients widely used for modifying the rheology, texture, microstructure, water activity, shelf life, release property and organoleptic properties of foods, pharmaceuticals, and fine chemicals. Effective dispersion and hydration of hydrocolloids are critical process steps for achieving the desired rested states and functionality. However, complex dynamic processes are involved during hydrocolloid hydration including wetting, swelling, dispersion and dissolution. A thorough understanding of the physicochemical interactions of HCs with solvents and the dispersion process at a multiscale is hence essential. *The goal of the collaborative project is to develop advanced modelling techniques for a wide range of HC particles so that dispersion of HCs can be optimised to promote rapid dissolution in order to avoid the formation of slowly dissolving aggregates.*

**Main Responsibilities/Activities**

The postdoctoral research fellow (PDRF) is expected to perform multi-physics modelling of the hydration of hydrocolloids (HCs), at molecular and single particle levels, in collaboration with three other postdoctoral research fellows in micromanipulation, discrete element modelling and finite element method. The PDRF will explore the multi-physics of hydrocolloids hydration and its sensitivity to temperature, pH and ions. The PDRF will need to develop molecular understanding of the dynamic process of hydrocolloid hydration through molecular dynamics modelling and investigate how temperature, pH and presence of ions affect the interaction of water molecules with the functional groups of hydrocolloids. Some experimental work will also need to be performed to understand the effect of temperature, pH and ions on the water sorption kinetics of single HC granules. It is also expected that the PDRF will regularly write technical report and papers, disseminate research outcome at national and international conferences, and may involve supervision of postgraduate and undergraduate research projects.

## Research Role Profile

--

### Person Specification

The post holder must have a good understanding of heat mass transfer and water sorption of composite material (E), a good track record in research publication and numerical modelling (E), working experience in molecular dynamics and computer programming (E), and a good knowledge of biopolymers (D). It is also expected that the PDRF has a high level of research ability and independence, and team-working skills to interact with other researchers, industry and the international academic partners (E). The successful applicant will have the opportunity to drive the research agenda and develop yourself as a future leader of chemical engineering and process science.

### Special Requirements

This project involves collaborations with UK universities and industrial partners, a good team work skill is also essential.

### Relationships and Contacts

Direct responsibility to the principal investigator or academic supervisor. The post holder may be asked to serve on a relevant Faculty committee. There may be additional reporting and liaison responsibilities to external funding bodies or sponsors. The post holder will work on original research tasks with colleagues in other institutions.