



Project Title:	Gelation by design for sustainable next generation consumer products
Lead Supervisor and co-supervisors:	Professor Karen Edler
Industrial Partner:	Unilever

### Project Summary

Aluminium salts have been used for over half a century as the active ingredient in antiperspirants to control sweat and associated body odour. When an antiperspirant is applied, the salts dissolve in the sweat or moisture in the underarm. The dissolved substance forms a hydrogel, which creates a temporary ‘plug’ in the sweat gland, reducing the amount of sweat that can rise to the skin’s surface. Despite extensive research efforts both in industry and academia, several fundamental questions remain unanswered such as the precise mechanism of gel plug formation and crucially the microstructure and properties of the resulting hydrogel that are directly linked to antiperspirant efficacy.

Unilever, a global leader in deodorants innovation, wishes to expand its understanding of the underlying physical processes that lead to effective gelation in the sweat gland. This project will seek to develop methods to study the physical chemistry of gel plug formation in solution and at interfaces in the presence of aluminium salts and other formulation ingredients such as polymers, surfactants, inorganic particles, low molecular weight gelators, and also their interaction with common biomolecules found in the sweat gland. Properties such as hydrogel nanostructure, gel strength and permeability will be probed using design of experiment methods to understand correlations in multi-component systems. The ultimate aim is to build a predictive model encompassing all formulation ingredients which will be critical for Unilever’s efforts to develop next generation natural and sustainable antiperspirants.

### Sustainability issues addressed

The research conducted in this project will contribute to Unilever’s efforts to develop the next generation of natural and sustainable antiperspirants.

### Eligibility criteria and selection process

Funding is available to candidates who qualify for ‘Home’ fee status. Following the UK’s departure from the European Union, the rules governing fee status have changed and, therefore, candidates from the EU/EEA are advised to check their eligibility before applying. Please see the Funding Eligibility section below for more information.

#### Candidate Requirements:

Applicants should hold, or expect to receive, a First Class or good Upper Second Class Honours degree (or the equivalent). A master’s level qualification would also be advantageous.

Non-UK applicants must meet our [English language entry requirement](#).

#### Enquiries and Applications:

Informal enquiries are welcomed and should be directed to [Prof Karen Edler](#) (email [k.edler@bath.ac.uk](mailto:k.edler@bath.ac.uk)).



Formal applications should be made via the University of Bath's [online application form for a PhD in Chemistry](#).

More information about applying for a PhD at Bath may be found on our [website](#).

#### Funding Eligibility:

In order to be considered for a studentship, you must qualify as a 'Home' student. In determining 'Home' student status, we follow the UK government's fee regulations and guidance which, when available, will be set out by the UK Council for International Student Affairs (UKCISA) on their [website](#). At the time of advertising this project, the fee regulations for 2021/22 have not yet been published, but we expect (subject to confirmation) that the main categories of students generally eligible for 'Home' fee status will be:

- UK nationals (who have lived in the UK, EU, EEA or Switzerland continuously since September 2018)
- Irish nationals (who have lived in the UK or Ireland continuously since September 2018)
- EU/EEA applicants with settled status in the UK under the EU Settlement Scheme (who have lived in the UK continuously since September 2018)
- EU/EEA applicants with pre-settled status in the UK under the EU Settlement Scheme (who have lived in the UK, EU, EEA, Switzerland or Gibraltar continuously since September 2018)
- Applicants with indefinite leave to enter/remain in the UK (who have been resident in the UK continuously since September 2018)

EU/EEA citizens who live outside the UK are unlikely to be eligible for 'Home' fees and funding.

Additional information may be found on our [fee status guidance webpage](#), on the [GOV.UK website](#) and on the [UKCISA website](#).