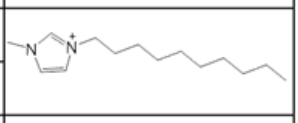
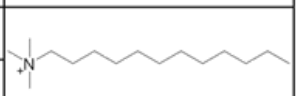
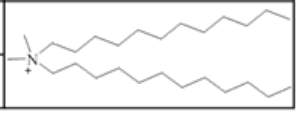
Magnetic surfactants for stimuli responsive interfaces and dispersions

About the project or challenge area: The project will generate a range of new magnetically-responsive colloids, surfactants and polymers (polyelectrolytes). These compounds have applications in oil-spill clean-up, remote control fluids, "magneto-rheological" fluids, environmental remediation, separations and targeted delivery etc. Surfactant systems responsive to pH, temperature, CO_2, and light are known [see the reference link below], however, new work from Bristol has introduced magneto-responsive surfactants as a new class of magnetic surfactants (MILS in the figure below). These magnetic compounds are of great interest as they exhibit amphiphilic behavior and are also magnetically active. Hence, they have novel potential applications, for example externally-stimulated control over fluid properties, magnetically-responsive interfaces, colloids, micelles, microemulsions, emulsions and polymer-surfactant complexes. The beauty of these materials is their chemical simplicity, since they can be easily obtained by mixing metathesis reactions, from cheap and readily available starting materials, based on commodity chemicals classified as safe for use. Furthermore, as shown in the figure the magnetic control effects can be observed at modest fields, provided by small hand-held magnets.

Sample	Anion	Cation
SURF 1	Cl^-	
MILS 1	$FeCl_4^-$	
SURF 2	Br^-	
MILS 2	$FeCl_3Br^-$	
SURF 3	Br^-	
MILS 3	$FeCl_3Br^-$	

Why choose this opportunity? The focus of your project will be on surfactants, polymers and colloid and interface science which will provide an excellent platform to learn about the design of functional materials and their practical applications. Your work in this area can make a real impact on global challenges, such as oil-spill clean-up, targeted delivery and critical cleaning. You will develop and increase your expertise in broad chemical synthesis and characterisation techniques, whilst becoming familiar with the fundamentals of colloid and interface science. Furthermore, this project will require your collaboration with other members across other research groups, thus improving your teamwork and networking skills. You will furthermore be developing a range of additional transferable skills, including presentation, scientific writing, and project and time management. Finally, you will be interacting with students from all over the world learning from their culture and skills, adding to your professional and personal development.

Full training will be provided for all aspects of this project. You will be embedded in the Supervisor's research group, who will provide support. In addition, you will be assigned a mentor for the duration of your project, who will provide extra support and help you to identify any additional training needs or opportunities.

About you: You will have skills and knowledge in general preparative chemistry, analytical methods, and colloid science, teamwork and time management. These skills are desirable but not essential.

Bench fees: A bench fee of £5,500 is required.

How to apply: Applications are accepted throughout the Academic Year and you should complete the online application form for Chemistry (MSc by Research).

Supervisor: Your supervisor for this project will be Julian Eastoe, Professor Chemistry in the School of Chemistry. You can contact him at +44 (0) 117 928 9180 or email Julian.Eastoe@bristol.ac.uk

Find out more about your prospective research program: This review article explains the general background to responsive surfactants:

Stimuli-responsive Surfactants, Soft Matter, 2013, 9, 2365 – 2374. https://doi.org/10.1039/C3SM27716J