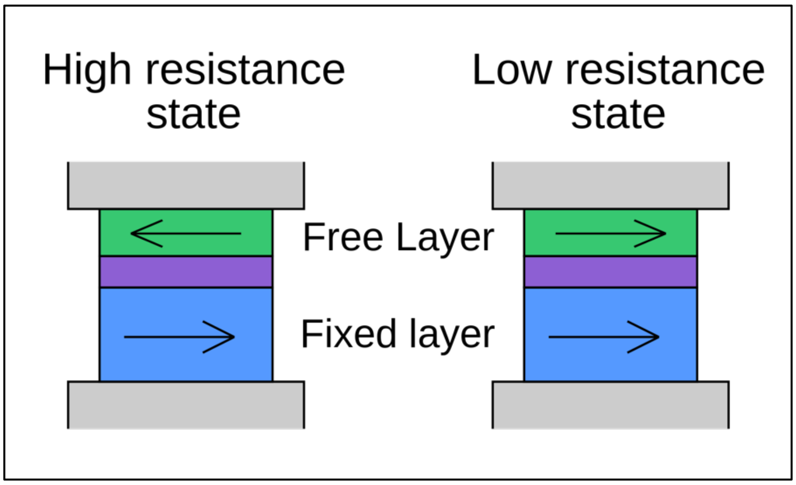
A new material for improved electronics

About the project or challenge area: The most important challenge currently facing humanity is that of climate change. To help fight climate change, the UK has a target to achieve zero carbon emissions by 2050, but this will require a paradigm-shift in the way that energy is generated, supplied, used and stored. One of the first and most important steps we can take is to fast-track the development of green energy technologies that decarbonize our energy supply and facilitate the deployment of more advanced renewables. This objective is at the heart of the European Green Deal and in line with the EU's commitment to global climate action under the Paris Agreement. Research has suggested that there is a type of material that could generate spin-polarized current without perturbing the surrounding elements magnetically in a spintronics device. These so-called half-metallic antiferromagnetic (HM-AFM) materials were first predicted to exist in 1995, but have not of yet been produced experimentally. By acting as a spin valve, an HM-AFM material would be able to perform as a magnetoresistive switch in a very small, applied field and as such, enable more energy efficient fast switching.



Research at Bristol has shown that inorganic materials can be synthesized with exquisite control over composition, even up to quaternary and quinternary compounds. This immediately opens the opportunity to synthesize novel compounds and test them for the long-sought after HM-AFM behaviour.

Why choose this opportunity? The focus of your project will be on the synthesis of inorganic compounds which will provide a tremendous opportunity to learn about the design of functional materials and their performance as HM-AFMs. Your work in this area can make a real impact on the global challenge of climate change. You will develop and increase your expertise in sol-gel and solid-state syntheses and characterization techniques, whilst becoming familiar with the fundamentals of spintronics. Furthermore, this project will require your collaboration with other members across other research groups, thus improving your teamwork and networking skills. You will also develop a range of 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: Ideally you will already have skills and knowledge in general chemistry, and analytical methods, along with teamwork and time management.

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 Professor Simon Hall, in the School of Chemistry. You can contact him via email - simon.hall@bristol.ac.uk

Find out more about your prospective research program: This recent article showcases our method of inorganic compound synthesis:

Facile synthesis of five strontium niobate metastable crystal compositions via sol-gel ionic liquid synthesis

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