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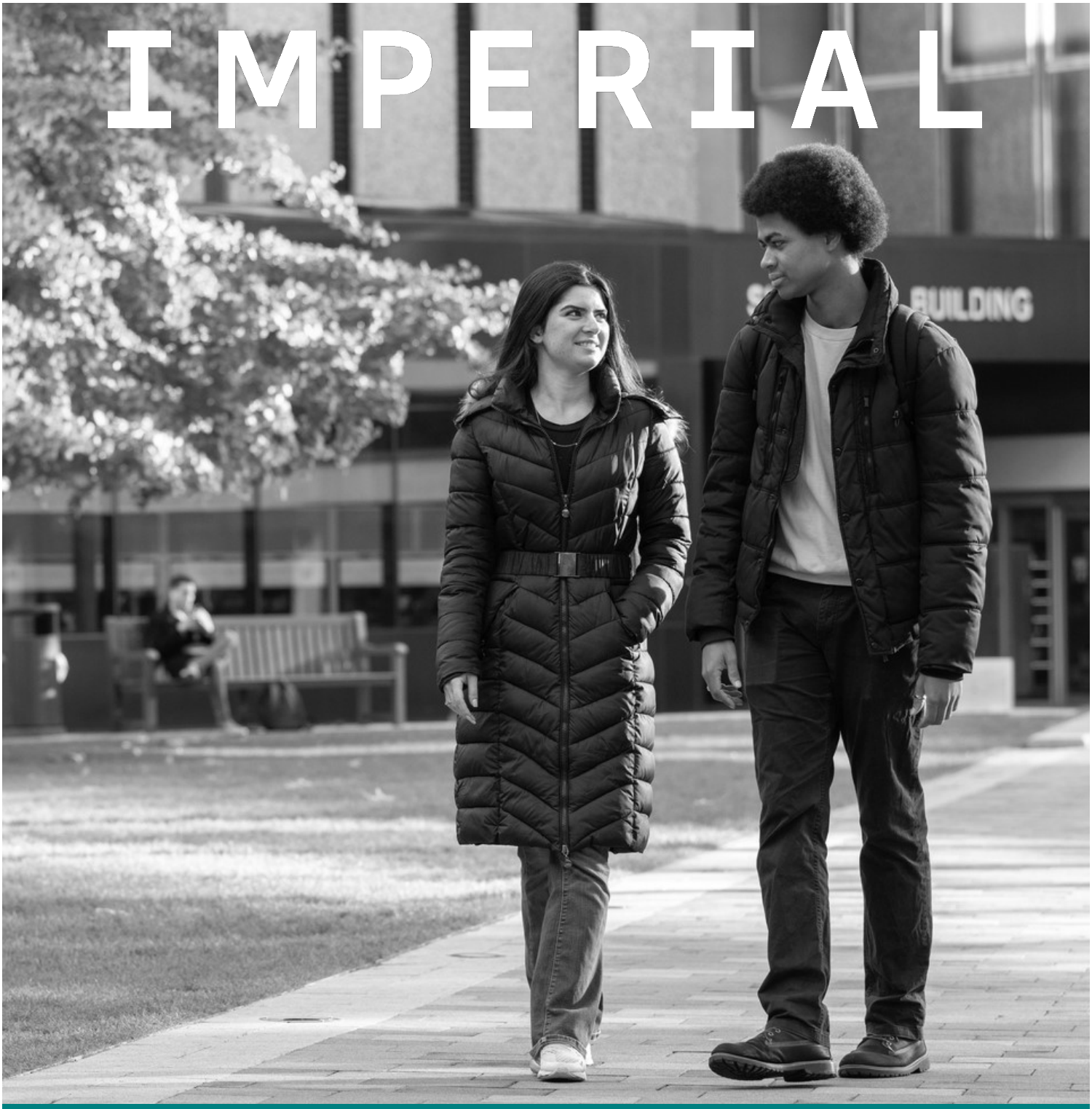

Sir Geoffrey Wilkinson Prize Studentship in Chemistry

Annual report for the Wilkinson Charitable Foundation
July 2024

Thank you for supporting exceptional PhD scholars to thrive at Imperial and beyond. Your generosity is providing financial security to talented researchers so they can expand their skills, broaden their horizons, and make important contributions to their wider field of study.

We also would like to take this opportunity to thank you for supporting the Sir Geoffrey Wilkinson Lecture Series, where distinguished speakers discuss cutting-edge developments in the field of chemistry. We are proud to celebrate the impressive legacy of Professor Sir Geoffrey Wilkinson and to inspire the next generation of great minds.

To the family and friends of Sir Geoffrey Wilkinson,

My name is Mrunal, and I am honoured to have received the Sir Geoffrey Wilkinson Prize Studentship in Chemistry in 2023. I am currently in the first year of my PhD in Chemistry at Imperial College London. I chose to study at Imperial for its outstanding reputation in chemical research, especially in the field of catalysis. Having pursued my undergraduate studies at Imperial as well, I have particularly enjoyed the cohesive academic environment in the Department of Chemistry which actively encourages cross-functional collaboration.

My work, supervised by Professor Nicholas Long and Dr Charles Romain, involves the design of redox-switchable catalysts for the synthesis of co-polymers. Due to the harmful effects of traditional plastics on the environment, research into the production of new bio-based or degradable plastics has gained momentum. Although promising, precise control of polymer properties remains a challenge.

Over the past year, we have developed a novel aluminium-based catalyst that displays high activity and excellent control for the production of poly(lactide). Upon addition of an oxidising agent, the catalyst changes state and is 'switched off'. However, in the oxidised state, the catalyst can be harnessed to polymerise a different monomer such as an epoxide. The eventual goal is to perform repeated 'switches' of the catalyst and target the formation of multi-block co-polymers. We have also made progress towards elucidating the step-by-step mechanism of the redox switch using a variety of analytical techniques such as nuclear magnetic resonance (NMR), electron paramagnetic resonance (EPR) and X-ray diffraction (XRD). Experimental findings have also been supplemented by density functional theory (DFT) calculations.

Currently, the 'switch' in our catalyst is reliant on the addition of auxiliary reagents such as oxidising and reducing agents. Not only is this wasteful, but it also leads to potential contamination of the final polymer matrix. We are therefore exploring opportunities to perform the 'switch' electrochemically.

After completing my PhD, I hope to continue working in the field of catalysis and sustainability in industry. The Department of Chemistry is situated in the heart of the White City Innovation District, and as such it is a great way for me to explore various companies and SMEs (small and medium-size enterprises).

I am extremely grateful to the Wilkinson Charitable Foundation for supporting this scholarship; it is a great means of honouring Professor Sir Geoffrey Wilkinson's legacy. The impact he has had on modern organometallic chemistry and catalysis is tremendous and it is truly humbling to have his name associated with mine. To have the opportunity to use catalysis for making an impact on sustainability is even more precious. The scholarship has given me freedom to pursue my research interests, without any financial burden. Through this project, I hope we can make meaningful progress and contributions to the field.

I would once again like to extend my heartfelt gratitude for your support. Thank you for your generosity.

Yours sincerely,

Mrunal Tamhankar