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Investigating the influence of synthesis parameters on the magnetic properties of carbon nanotubes filled with magnetic metals

Carbon nanotubes (CNTs) are a 1D tubular nanomaterial in which carbon atoms are bonded to one another in an sp^2 fashion to form a honeycomb structure. These materials are of high interest to both the scientific and industrial communities due to their outstanding properties, including their immense mechanical strength and high thermal and electrical conductivity. My project involves producing CNTs filled with magnetic metals. The addition of magnetic properties to the already impressive characteristics of CNTs broadens the array of applications for which CNTs are suitable, resulting in a material with vast potential in a large array of fields.

I had the privilege to work with Professor Toru Maekawa and his team at the Bio-Nano Electronics Research Centre (BNERC), in Toyo University during my stay in Japan. They were very supportive and accommodating, I am truly thankful for their help over the 10 weeks, I certainly learnt a lot during my stay! Over the course of the summer, I learnt to collect magnetic data using the Superconducting Quantum Interference Device (SQUID), investigated the effects of external magnetic manipulation on the CNTs and carried out various characterisation techniques to gather further information on my materials. These techniques included X-ray Diffraction (XRD), X-ray Photoelectron Spectroscopy (XPS) and Fourier Transform Infrared Spectroscopy (FTIR), to name a few. From my time at BNERC, I have collected a lot of interesting data and set up a long-standing collaboration there.



A picture showing some of my work colleagues at BNERC

As I lived in Tokyo, I was able to easily travel across most of Japan, something that I fully exploited! On weekends, I spent a lot of time travelling, from as far as Fukuoka on Kyushu island, to Hiroshima and Kanazawa. As a result, I was able to immerse myself in a culture so different to my own. I took part in traditional Japanese matsuri (festivals), watched the mesmerising hanabi (fireworks) with hundreds of other spectators and was lucky enough to be taught home cooking by a wonderful, friendly Japanese lady. These memories, and many more, will be treasured forever. My time in Japan has not only allowed me to grow as a scientist, but has enabled me to catch a glimpse of life in Japan- a modern society with deep traditional roots. I am very grateful to have been given this fantastic opportunity and my only advice to future JSPS Summer Fellows is to make the most of their time there- work lots, observe lots (both in and out of the lab) and above all, experience lots! A final piece of advice- talk to lots of people at the orientation week, they will be your travel buddies and I have made some amazing friends over the course of the summer. Gambatte!



At Kinkaku-ji in Kyoto with some JSPS Summer Fellows