

Searching for excitonic superconductivity via transition metal dichalcogenides & carbon composites.

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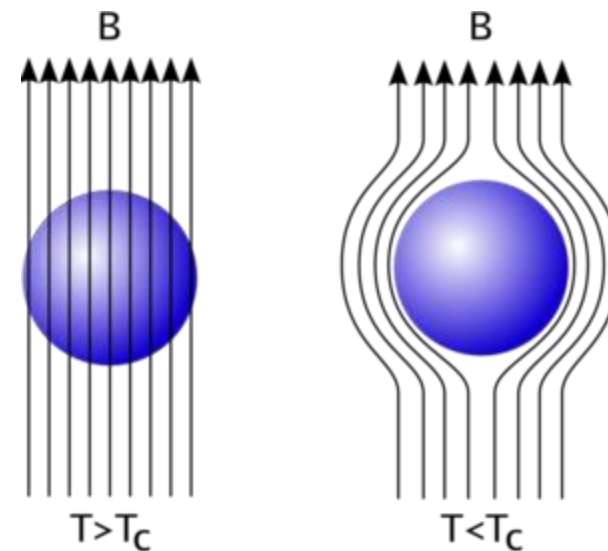
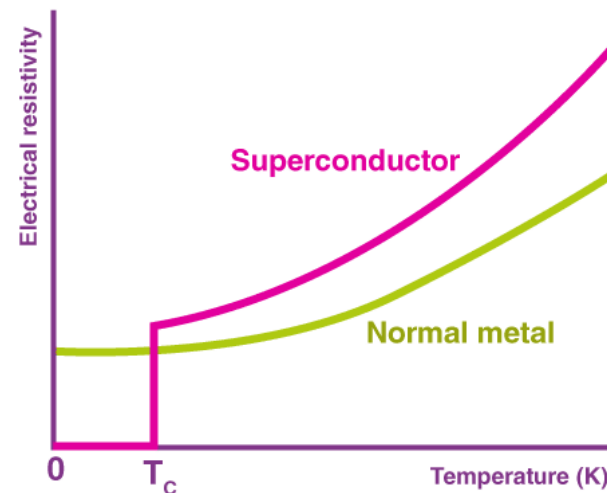
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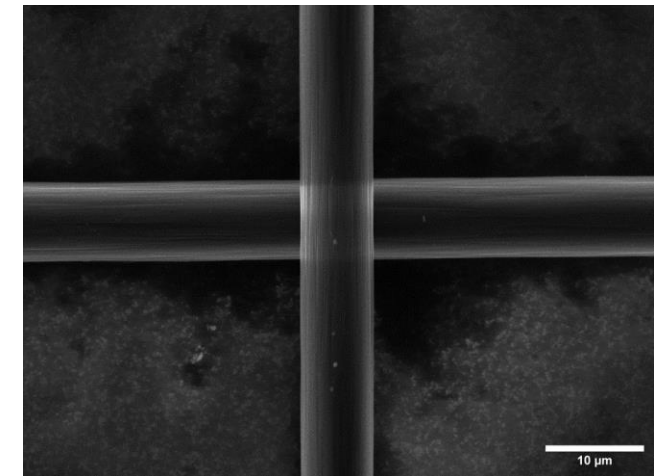
What is Excitonic Superconductivity?

- Superconductors have 0 DC Resistance, as well as the repulsion of magnetic field lines from within the material (Meisner effect).
- Require cryogenic cooling.
- Excitonic superconductivity relies on the pairing of an excited electron and hole pair to carry a supercurrent.

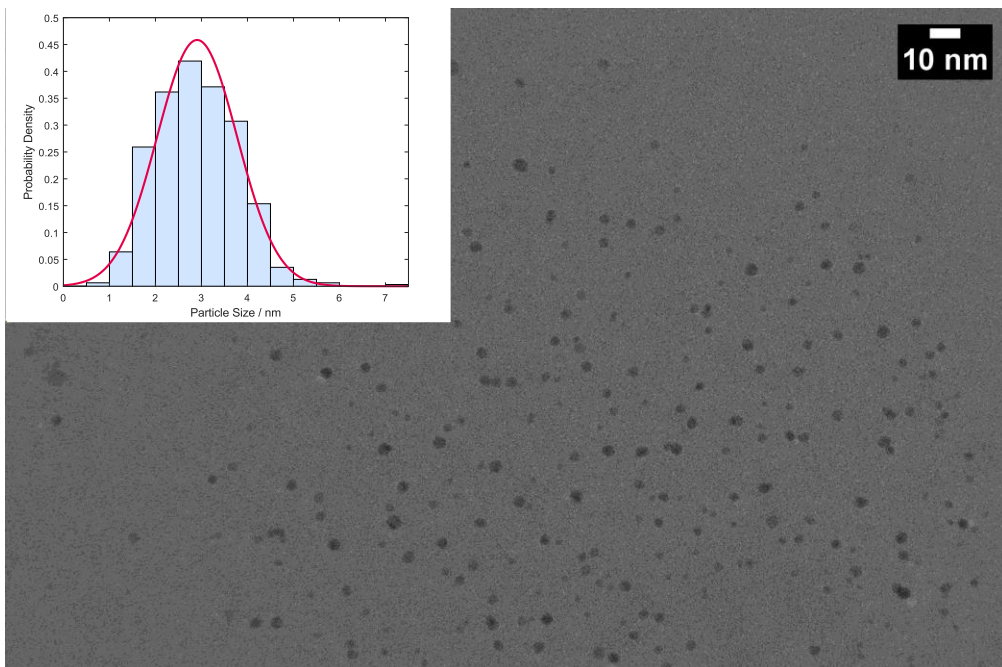


Nanoparticle Synthesis and Carbon Fiber Coating

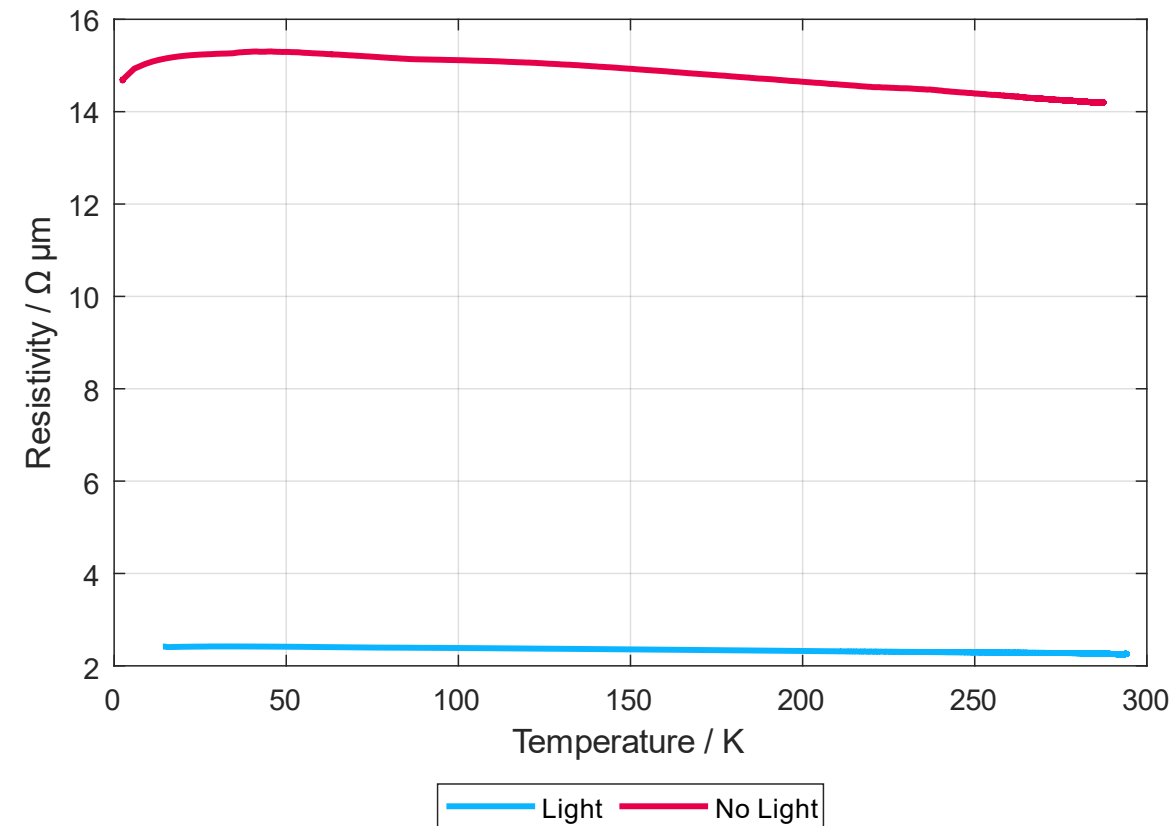
1. Bulk WSe_2 powder was ground to a fine powder and suspended into ethanol
2. The suspension was sonicated in an ice bath to yield WSe_2 nanoparticles.



Key Results



TEM images show round nanoparticles of WSe_2 with an average size of 2.94 ± 0.1 nm.

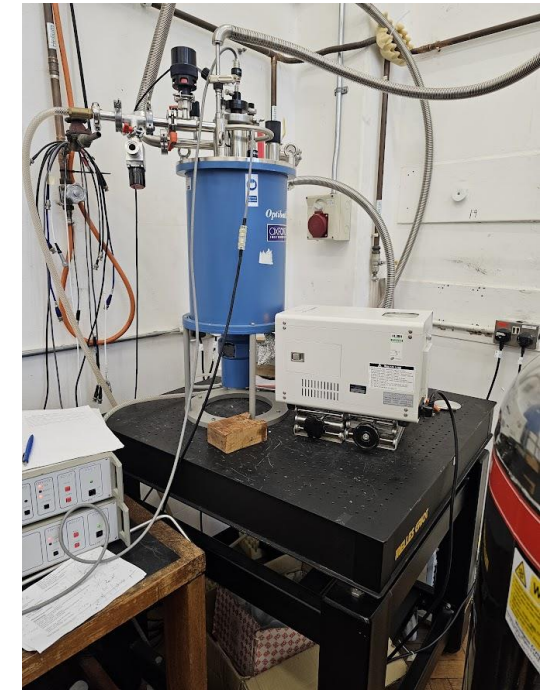
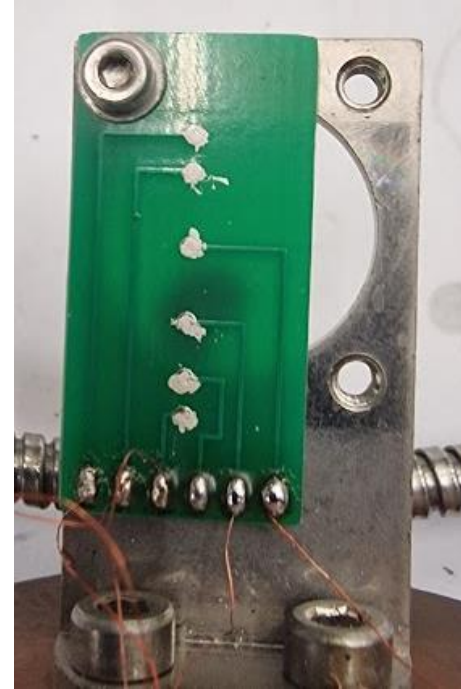


An average drop of $12.53 \Omega \mu\text{m}$ in resistivity was seen. Whilst superconductivity was not seen, this drop in resistivity may be due to excitonic contributions.



Conclusions and Future Work

- The addition of a WSe_2 layer on a carbon fiber shows a significant reduction in resistivity.
- Superconductivity, however, has not been observed.
- Can this system be tuned to optimise the interactions between the coating and fiber to induce superconductivity?



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Thank you for Listening

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