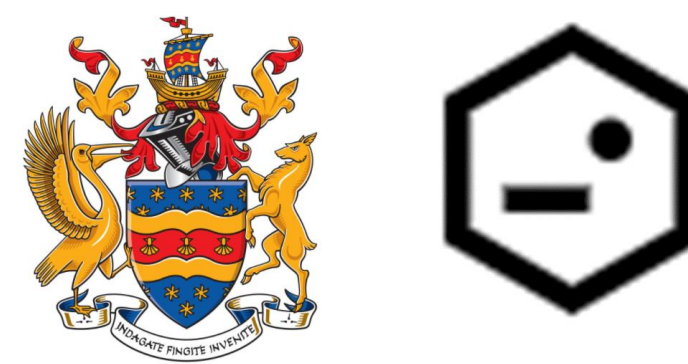


# Analysis of the Mechanical Properties of SWNT and MWNT Polymer Nanocomposites Manufactured using Resin Additive Manufacturing



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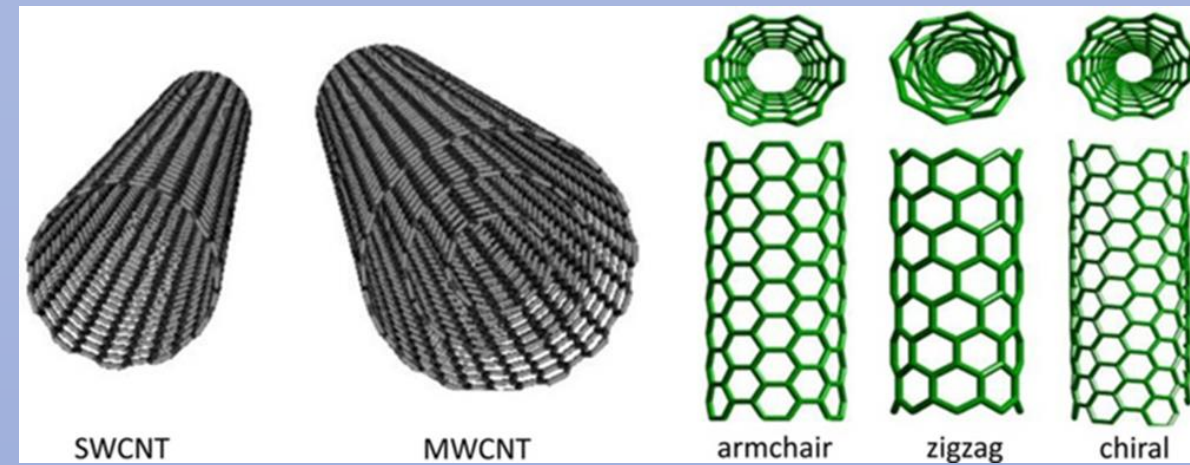
School of Engineering, Computing, and Mathematics. Faculty of Science and Engineering. University of Plymouth  
Poster presentation submitted in partial fulfilment of the requirements for the degree of BEng (Hons) in Mechanical Engineering with Composites



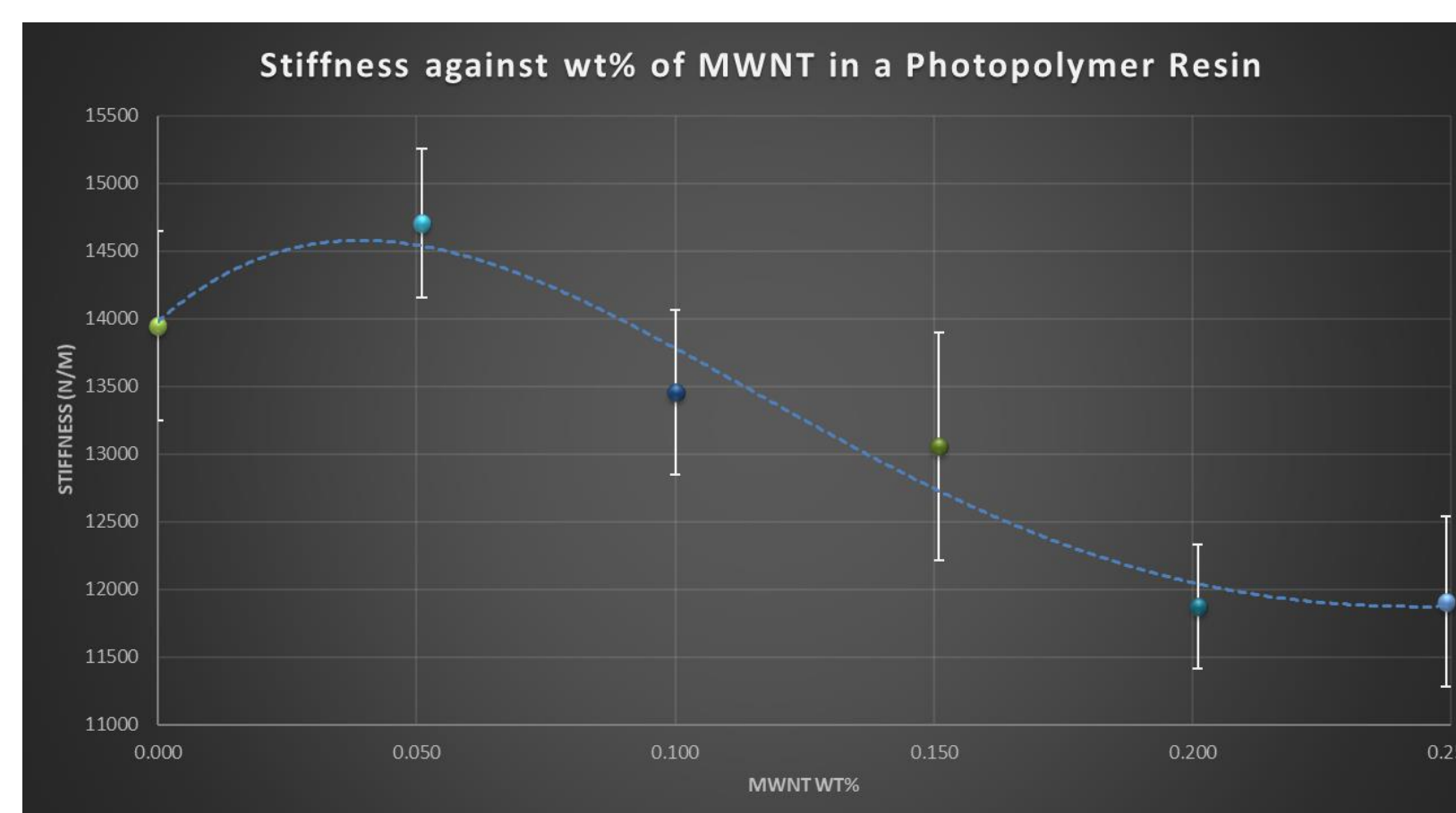
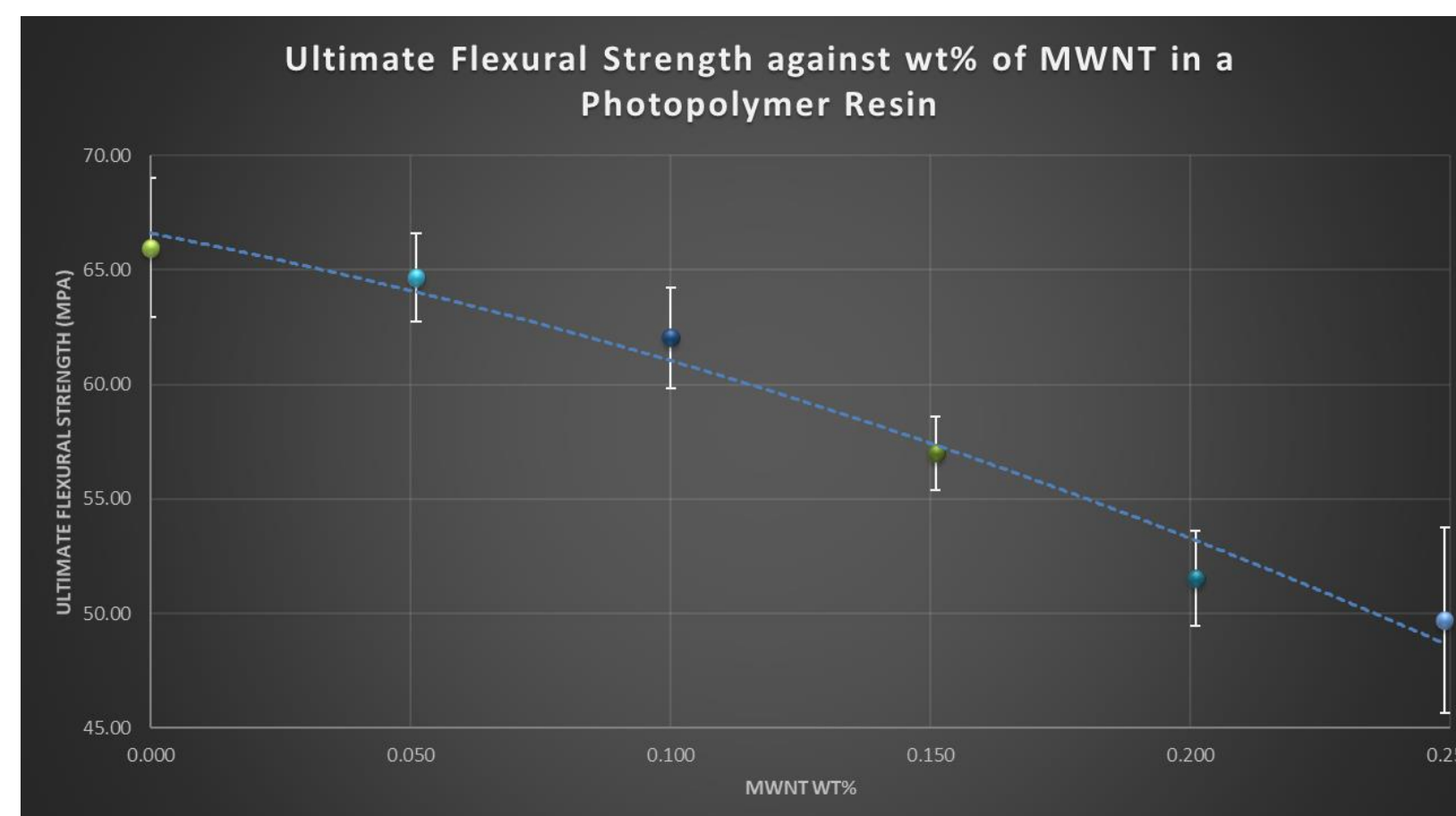
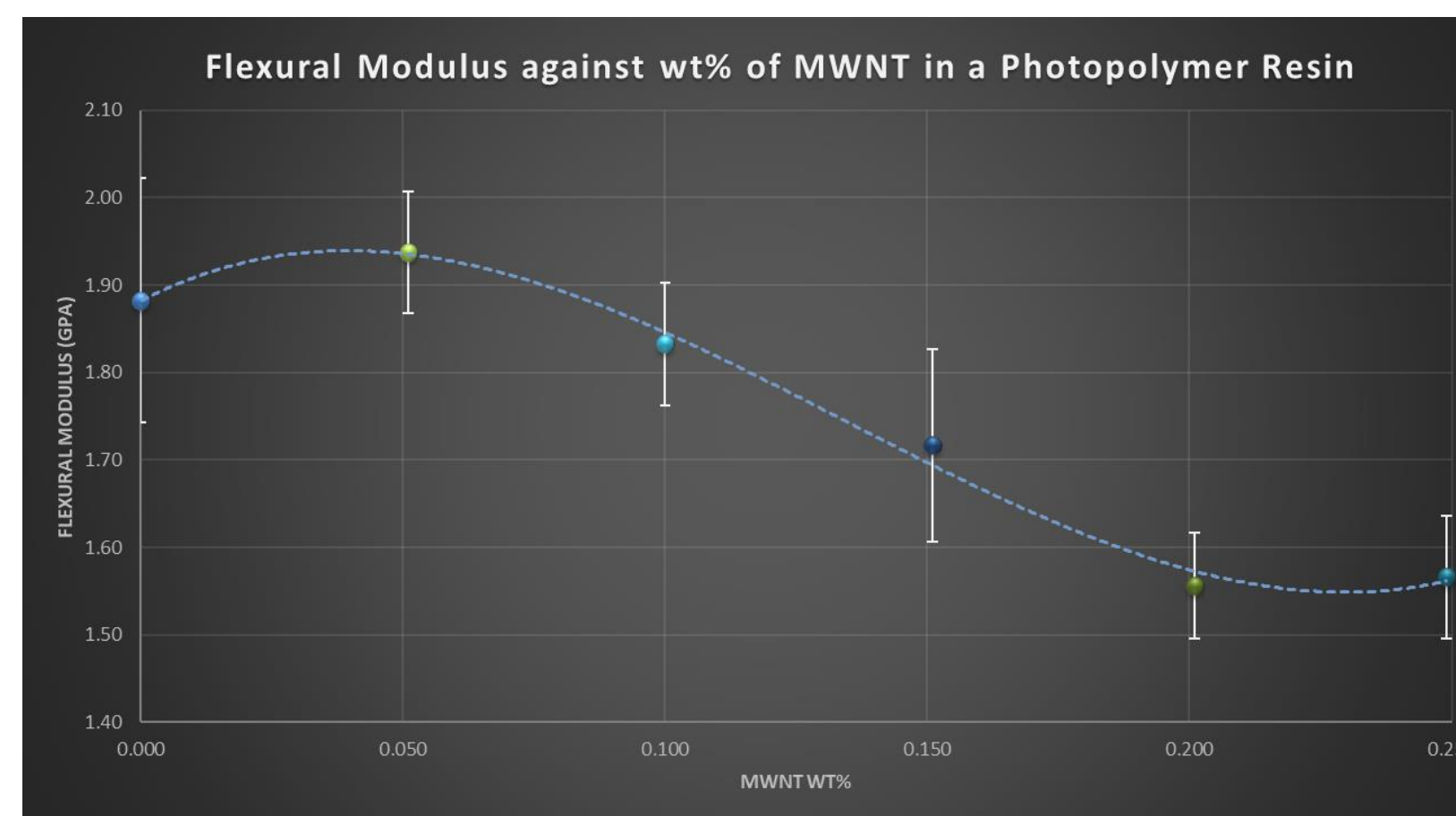
## Objectives

The objective of this research was to;

- See if polymer nanocomposites could be produced using a resin printer.
- How different wt% nano particles affected mechanical properties.
- If the type of nano particle changed the mechanical properties.
- Compare properties to similar polymer nano composites.



## Mechanical Properties



## Conclusions

- It is possible to produce a polymer nanocomposite using resin additive manufacturing techniques.
- There are limitations on the type of nanoparticle and maximum wt%, as the biggest restricting factor seen was resin viscosity.
- The type of nanoparticle used had a greater impact on printability compared to the wt%.
- Specific Surface area was the main contributor to resin viscosity.
- Overall the addition of CNT's had a negative effect on the mechanical properties in this experiment.
- From this research there are negligible practical mechanical benefits if any, to adding CNT's to a resin matrix for use in additive manufacturing.
- There is further scope to look at how other nanoparticles and the print settings affect the mechanical properties.
- Did not show improved mechanical properties like other polymer nano composites.

## Methodology

1. Add CNT's to resin to make appropriate wt% solution.
2. Using a magnetic stirrer mix the solution for one hour.
3. Using an ultrasonic bath mix further for an hour.
4. Print test specimens using a resin 3D printer to the appropriate test standards.
5. Clean test samples with isopropyl alcohol and post cure for 12 minutes.
6. Conduct a flexural three-point bend test and record force against displacement until failure.
7. Analyse data and failed samples to determine material properties and failure methods.

