

Characterizing Young's Modulus for C₆₀ Whiskers

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In recent years, work at the University of Tsukuba and National Institute for Material Science (both in Tsukuba, Japan), has led the way for determining the mechanical properties of C₆₀ nanowhiskers using compressive deformation techniques [1]. They concluded that the Young's modulus of their nanowhiskers had an estimated range of 32-54 GPa. This is in excess of the 8.3-20 GPa range that they reported in their survey for bulk crystal C₆₀ [1].

At Imperial College London, work on the electrical and mechanical characterization of C₆₀ whiskers and nanowhiskers was undertaken within a two-year research programme [2]. Within this activity, a micromachined electrothermal 4-point bend tester was developed for C₆₀ whiskers, for operation under an optical microscope. The characterization of Young's modulus, using the results from one of our experiments, will be reported.

Our C₆₀ whisker has a diameter of 4 μm, which is at least 25 times thicker than those reported by Asaka *et al.* This makes it an interesting sample for comparison. From the limited experimental data available (two data points from Asaka *et al.* and one from our work, Young's modulus can be crudely modeled, as shown in Figure 1.

Ideally, more data points from controlled samples are needed in order to determine a more definitive model, but the inverse proportionality of Young's modulus to C₆₀ whiskers diameter is evident. This contradicts any notion of a fixed value of Young's modulus for C₆₀ whiskers.

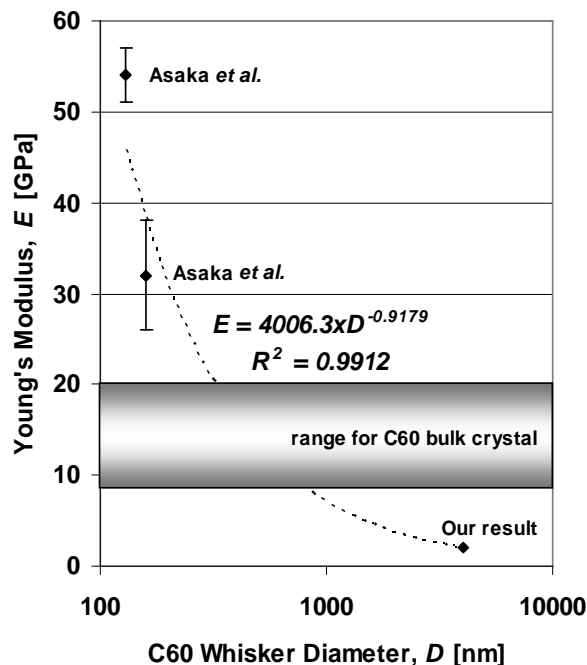


Fig. 1 Characterization of Young's modulus with C₆₀ whisker diameter.

The authors are very grateful to Dr Kun'ichi Miyazawa, for providing the initial inspiration for our work on C₆₀ whiskers and ongoing discussions. We also like to thank the UK's Engineering and Physical Research Council for funding this research (under grant GR/S97019/01).

References

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