**Intense infrared pulses give defects in diamond a shakedown**

Supervisor: Prof James Lloyd-Hughes, Physics, (J.Lloyd-Hughes@warwick.ac.uk)

Co-supervisors: Prof. Mark Newton, Physics, (m.e.newton@warwick@warwick.ac.uk)
Prof. Vasilios Stavros, Chemistry, (V.Stavros@warwick.ac.uk)

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We have recently developed methods based on ultrafast infrared absorption spectroscopy that can be used to uncover the energetic structure of the vibrational modes of defect complexes in diamond. We can directly track the energy relaxation processes for the local vibrational modes of defects, showing how quickly they interact with their environment and other coupled vibrational states. The proof-of-concept experiments have been performed on one vibrational mode (C-H stretch) of one defect complex ($N_3V$:H) only, under a limited set of experimental conditions.

The main research challenges are to (1) exploit this state-of-the-art experimental methodology to examine different local vibrational modes; (2) better quantify the anharmonicity of the potential using multiple photoexcitation; (3) validate that the concentration of key defect complexes extracted from our optical methods matches the concentration expected from other techniques; (4) examine how the electronic states of defects couple to their local vibrational modes. Taken in conjunction, this project will advance our understanding of defects in diamond dramatically, building on a successful collaboration centred around the current PhD student's work.

**You should have obtained, or be about to obtain a First or Upper Second Class UK Honours degree in physics, chemistry, material science or a related subject. Applicants with equivalent qualifications gained outside the UK will also be considered. This project involves collaboration with a major international industrial partner and there will be opportunities for working in their laboratories.**

**For further information please contact James Lloyd-Hughes, Physics, (J.Lloyd-Hughes@warwick.ac.uk) or DST.Admin@warwick.ac.uk.**