Ultrafast Photodissociation of Solid State Triiodide - Sample Preparation

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Ultrafast electron diffraction is an extremely useful tool that makes it possible to visualize atomic motions in three-dimensional space with respect to time. This is referred to as "the molecular movie," the making of which was the project goal. The molecular movie enables one to watch a chemical reaction as it happens, a feat that requires a time scale on the order of 100 femtoseconds (10^{-15} s)[1].

The reaction of interest was the photodissociation reaction undergone by the triiodide anion (Equation 1)[2].

Equation 1: $I_3^- \rightarrow I_2^- + I^\bullet$

Triiodide was chosen for a number of reasons. It is a simple, triatomic anion, making it relatively easy to study. It also has a number of unique characteristics. For example, it violates the octet rule and has excited electronic states below the electronic detachment threshold[3]. Furthermore, triiodide has broad absorption peaks centred at 290 and 350 nm[2], making it possible to use the readily available 266 nm light to induce the reaction.

The main task of the summer was to create a thin film of a triiodide-containing salt that is stable under vacuum. This task proved not to be trivial. At this point, such a film has not been successfully created.

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[2] Landrum, G., Goldberg, N., and Hoffmann, R. *J. Chem. Soc.,* (1997) **19**, 3605-3613.
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