Photophysical Characterization of Fullerenes as Undergraduate Physical-Organic Laboratory Experiments

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Photoacoustic calorimetry (PAC) is a powerful tool for studying photophysical properties of molecules as well as energetics of discrete chemical reactions. PAC can be thought of simply as "listening to molecules" as they decay from an energetically excited state. The laser technology employed is similar to equipment already employed in many physical chemistry laboratories and is, therefore, easily implemented as a complimentary exercise and a typical lab can be accomplished in four hours.

PAC can be used to characertize excited state energies and lifetimes of the fullerenes, both in dilute solution, and under conditions where reactions occur. For example, the triplet state energy of C_{60} is readily and accurately determined, as can the ability of C_{60} to create singlet oxygen. This presentation will describe how undergraduate laboratory courses can implement experiments to precisely and accurately characterize the photophysical properties of individual fullerenes.