Polymer Program

INSTITUTE OF MATERIALS SCIENCE

Seminar: 11:10 am Friday, February 2, 2024

Science 1: Room 1002

Host: Alex Asandei

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Light-to-Heat (Photothermal) Conversion Promotes High Activation Barrier Reactions

Photon-driven processes have become a powerful tool for achieving challenging bond cleavages and formations. Photocatalysis offers temporal and spatial control with low-energy light, which has been widely advantageous for efficiently building molecular complexity from simple starting materials. The judicious choice of photocatalysts enables the precision of reactivity that is rarely achieved with other forms of catalysis and heating. An underused area of photocatalysis is light-to-heat (photothermal) conversion. Irradiation of specific nanoparticles or dyes with visible light creates intense thermal gradients in a photothermal conversion process. In contrast to bulk heating, where the temperature remains uniform across a reaction medium, substrates would only experience thermal energy within a few nanometers of excitation under temporal heating. Consequently, this process would use irradiation to drive chemical processes at high temperatures with temporal and spatial control. I will show this phenomenon as applied to challenges such as chemical recycling to monomer, broad-spectrum wavelength photocontrolled polymerizations, intramolecular rearrangements, and intermolecular coupling reactions.

The stachelab: https://stache.princeton.edu/