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Editorial note on Introduction to photo chemistry

Nikitha Yerram*

St. pious X degree and PG college for Women College, Hyderabad, Telangana, India

***Corresponding author:-** Nikitha Yerram, M.Sc. biochemistry St. pious X degree and PG college for Women College, Hyderabad Telangana, India E-mail: yerramnikitha21@gmail.com

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The branch of chemistry dealing with the chemical effects of light is known as photochemistry. This term refers to a chemical reaction induced by the absorption of ultraviolet (wavelengths between 100 and 400 nm), visible light (400–750 nm), or infrared radiation (750–2500 nm) radiation.

Photochemistry is important in nature because it is the cornerstone of photosynthesis, vision, and the formation of vitamin D from sunlight. [Photochemical reactions vary from temperature-driven reactions in how they operate. Photochemical pathways gain access to high-energy intermediates that cannot be produced thermally, enabling reactions that would otherwise be inaccessible by thermal processes to resolve significant activation barriers in a short amount of time. The photo degradation of plastics exemplifies how harmful photochemistry can be.

The activation energy in photochemical reactions is given by light. Light is one mechanism for supplying the activation energy needed for several reactions, to put it simply. To create a desired electronic and vibrational state, a molecule can be excited selectively with laser light. Similarly, the pollution from a specific state can be tracked selectively to provide a population estimate for that state. Scientists can track the energy distribution of a chemical reaction's products until the variations in energy are smeared out and averaged by repeated collisions if the chemical system is at low pressure.

As defined by the Woodward–Hoffmann selection rules, the absorption of a photon of light by a reactant molecule can enable a reaction to occur not only by bringing the molecule to the required activation energy, but also by changing the symmetry of the molecule's electronic configuration, allowing an otherwise inaccessible reaction path. One example of a pericyclic reaction that can be studied using these rules or the related frontier molecular orbital theory is a 2+2 cycloaddition reaction.

Photochemical reactions can be hundreds of times faster than thermal reactions; reactions as fast as 109 seconds and related processes as fast as 1015 seconds have been observed.
A photosensitizer absorbs the photon and passes the energy to the reactant, or the photon may be absorbed directly by the reactant.