**Healing with Light: IIT Indore's Eco-Friendly Breakthrough in Medicine**

Researchers at IIT Indore have developed a smart and eco-friendly method to create nitrogen-based chemical compounds that are widely used in medicines. These compounds, known as heterocycles, are key components in drugs used to treat conditions like allergies, cancer, depression, and more. Traditionally, making these compounds involved harsh processes, including high temperatures and large quantities of expensive or harmful chemicals. Now, using visible light particularly blue light, scientists have found a simpler, safer, and energy-saving way to produce these molecules at room temperature.

The research focused on a special class of nitrogen-containing compounds called pyrido[1,2-a] pyrimidin-4-ones. These compounds have a flat and rigid structure, which helps them attach easily to targets in the human body, making them useful in treating diseases. Drugs like Permirolast, used for allergies, and other potential treatments for cancer, spinal muscular atrophy, and inflammation are based on this structure.

Using visible light and special chemicals called photoredox catalysts, the team successfully added different groups—such as acyl, aryl, alkyl, and alkenyl—to these compounds. In some cases, they also combined this method with transition metal catalysts under light to improve results. This new approach offers exciting possibilities for designing and developing compounds with important medical uses.

The process works under mild conditions, using a homemade photoredox setup developed in the lab. The researchers checked the light's wavelength with a photo spectrometer to ensure it was in the required range and included a cooling fan to maintain room temperature. This method produced high-quality results with various chemical groups and showed good to excellent yields. Currently, the team is working on synthesizing even more promising drug-like molecules, including those that could help treat endothelial cell dysfunction and inflammation.

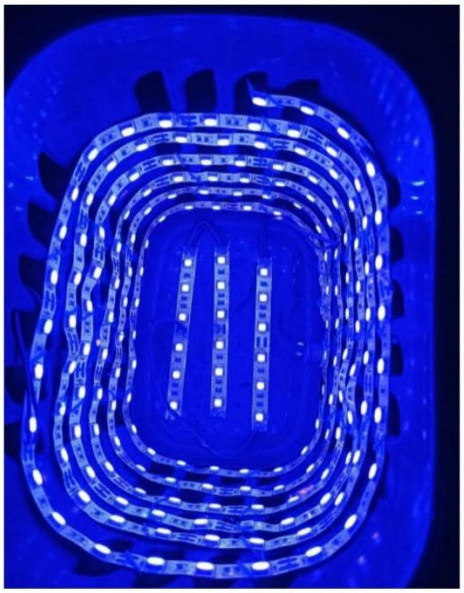
"This work is a fine example of how fundamental science can lead to sustainable technological advances. At IIT Indore, we are committed to encouraging research that combines innovation with environmental responsibility," said Prof. Suhas Joshi, Director, IIT Indore.

Dr. Umesh A. Kshirsagar, the Principal Investigator of the project, added, "Our goal was to develop a process that is not only efficient but also green. By using visible light under simple conditions, we have created a pathway to design important medicinal compounds with less environmental impact and greater affordability."

This innovative method is not only cost-effective and efficient but also represents a greener and cleaner direction for chemistry. It holds great promises for advancing both healthcare and environmental sustainability.

Homemade photo-redox reaction setup:

**a) Home-made photo-reaction setup (458 nm)**



**b) Blue LED strips**