

Effect of different dyes and photocatalysts on photocatalytic decomposition of methanal would be investigated. A prototype would be built after optimizing the combination of dye with photocatalyst.

Furthermore, the green colour of the reaction flask was gradually decreasing in intensity, which is a sign that the chlorophyll was being oxidised. The decrease of available chlorophyll lowers the efficiency of the photocatalyst, hence lowering the overall efficiency of the device. This can be solved by adding chlorophyll-hexane solution to the reaction mixture to extend the lifetime of the setup. Also,

As briefly mentioned above, the possibility of integrating haem as a natural dye is also being explored. More time is needed to refine the extraction process of haem such that the haem extracted is of a decent purity for effective photocatalysis.

The possibility to substitute the central Fe^{2+} ion in haem with Zn^{2+} ions shall be tested as Zinc porphyrins are known to have better photocatalytic capabilities.

Though synthesised already, the implementation of phthalocyanines as a photocatalyst is still under testing, and more methods should be investigated to improve charge transfer between phthalocyanine molecules and the TiO_2 .

6. Conclusions

Effect of various wavelength of light, catalyst size and chlorophyll dye on photodecomposition of methanal by TiO_2 was investigated and TiO_2 NPs coupled with red light and chlorophyll dye with a stainless-steel sieve solid support was found to be the most effective method of decomposing methanal. The most effective method shows a decomposition rate of methanal $7.89 \times 10^{-9} \text{ mol min}^{-1}$, under the condition of solid supported chlorophyll-sensitised TiO_2 NPs under red light irradiation of (graph 6).

7. Implications

Through this miniaturised setup, it is proved that methanal decomposition is achievable and feasible by photocatalysis. Through the data show in section 4, the device is very effective at removing high concentrations of methanal in the air, while being relatively compact and easy to operate. This methanal decomposition device can be widely employed in sites suspected of having high methanal concentration, for example, construction sites, new homes, wood processing factories and so on.

In practice, the device can operate under two settings: with sunlight, and without sunlight. This enables the device to run under any condition.

With sunlight, LEDs are not required to undergo photocatalysis. From the transparent top part of the device, the reaction flask receives sunlight, which more than enough, includes all wavelengths of light used in the photodecomposition. The device will also charge under sunlight to run the LEDs at night time or low-light situations.

Without sunlight, the LEDs will use the dry cells or the solar charged batteries (if adequately charged) to operate. The device will emit red light specifically to maximise the efficiency of decomposition.

In short, the prominent feature of the created methanal decomposition setup is that it is potentially more effective than any out in the market and cheap to use, with the ability to operate with or without sunlight.