ZnO Nanofluid Shape Effects in Photocatalysis of Methylene Blue

M Ramya[1], Jitha P Marydasan[2], Swathy Satheesh[2], V P N Nampoori[1] and M Kailasnath[1]

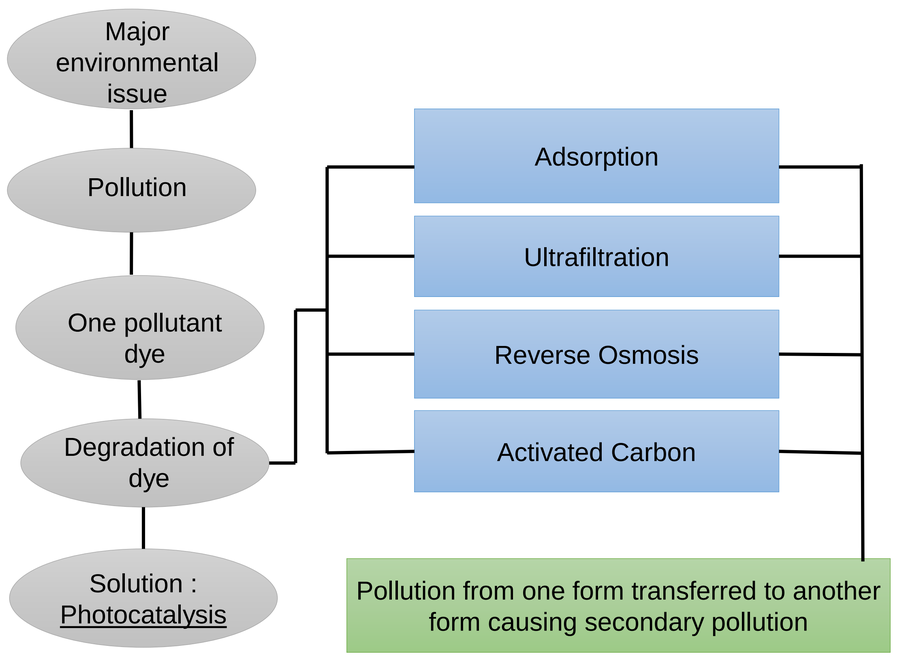
[1]International School of Photonics, CUSAT, Kochi, Kerala, India.

[2]Ansar Women's College, Perumpilavu, Thrissur, Kerala, India.

Abstract

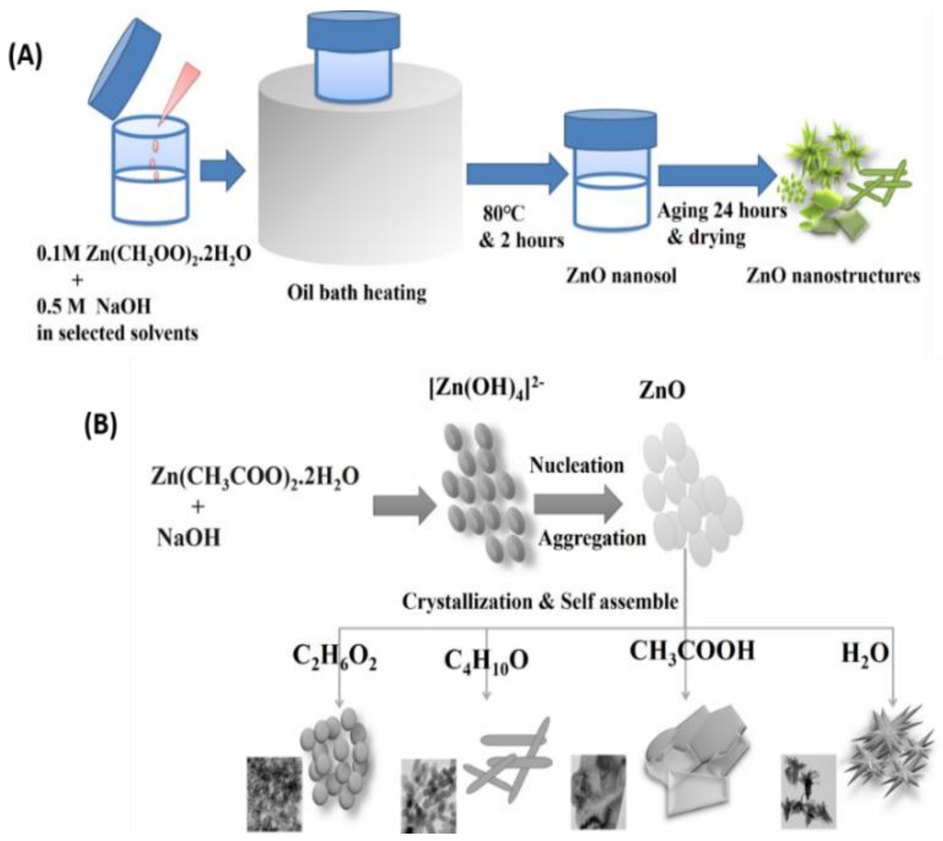
In the present study, efficient ZnO nanostructure photocatalysts were prepared by a simple solution method. HR-TEM reveals the formation of nanodot, nanorod, nanoplate, and nanoflower morphology. Solvent physicochemical properties affect the growth kinetics and morphological evolution. ZnO nanoflower exhibits excellent photocatalytic performance than the other structures towards methylene blue degradation due to their larger surface area. Higher surface area enhances the dye adsorption and photodegradation efficiency to 85% under exposure to visible light after 20 minutes.

Introduction



Preparation of ZnO nanostructures

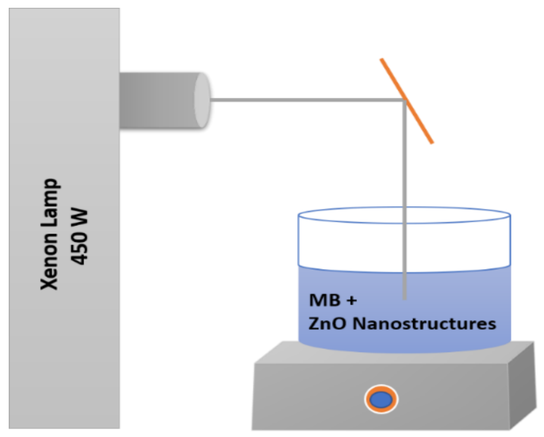
Fig 1: (A) Solution method and (B) ZnO nanostructure : Growth Mechanism



Conclusions

The present study explored the shape-dependent photocatalytic activity of ZnO nanostructure in the process of degradation of methylene blue. From this, we understand that photocatalysis highly depended on the morphology of the catalyst. The increased surface area of nanostructures provides more active sites for dye adsorption which enhances the catalytic reaction.

Experimental Set up



1mg of ZnO nanostructures were dispersed in 10µM dye solution under continuous magnetic stirring for 30 minutes in dark to obtain a colloidal solution. The suspension was continuously irradiated with a Xenon lamp (450W) and take UV absorption (JASCO V-570) spectra of the sample were recorded after 20 minutes.

Results

Fig 2: TEM image of synthesized ZnO nanostructures

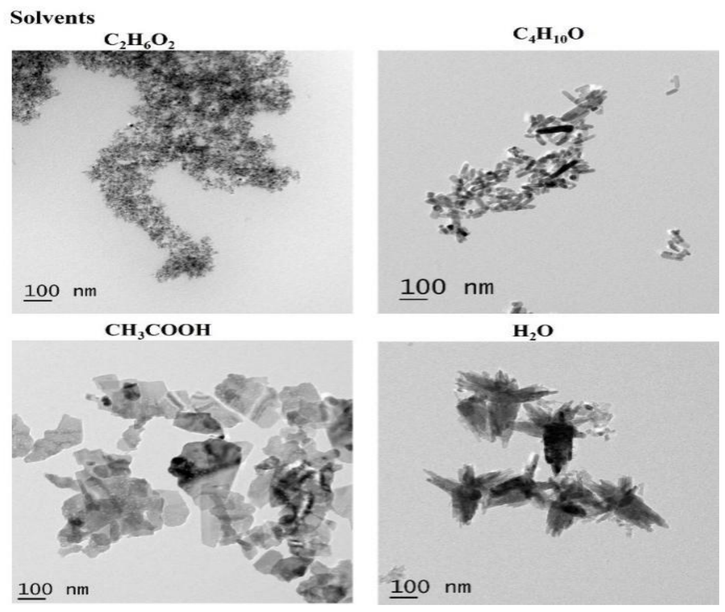


Fig 3: (A) Absorption & (B) Percentage of degradation of methylene blue

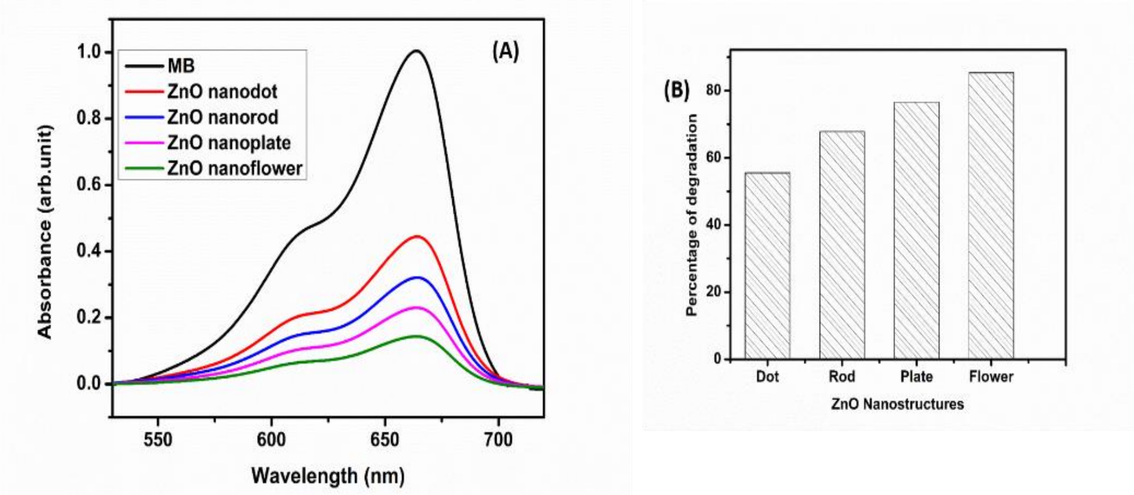
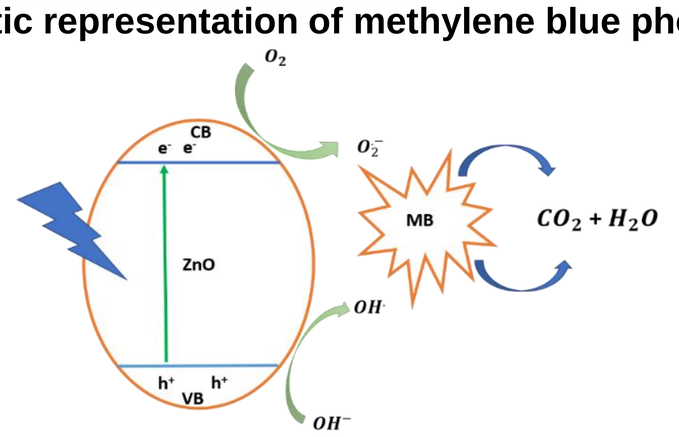


Fig 4. Schematic representation of methylene blue photodegradation



References

1. M. Ramya, T. K. Nideep, V. P. N. Nampoori, and M. Kailasnath, Sci. Rep., 2021, 11, 1–14.
2. M. Ramya, T. K. Nideep, V. P. N. Nampoori, and M. Kailasnath, New J. Chem., 2019, 43, 17980–17990.
3. M. Ramya, M., Nideep, T. K., Nampoori, V. P. N., Kailasnath, Surfaces and Interfaces, 2021, 26, 1–10.
4. M. Ramya, T. K. Nideep, K. R.Vijesh, V. P. N. Nampoori, and M. Kailasnath,Opt. Mater.,2018, 81, 30-36

International Conference on
Composite Materials for Environment Protection & Remediation
(ICCMEPR - 2024) 02-03 July, 2023

RESEARCH PLATEAU PUBLISHERS