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Impact of Collected Sunlight on ZnFe₂O₄ Nanoparticles for Photocatalytic Application

N.G. Yadav,^{1†} L. S. Chaudhary,^{1†} P. A. Sakhare¹, T. D. Dongale,¹ P. S. Patil,^{1,2} A. D. Sheikh^{1*}

¹School of Nanoscience and Technology, Shivaji University, Kolhapur 416004, M.S., India.

²Thin film Materials Lab, Department of Physics, Shivaji University, Kolhapur 416004, M.S., India.

*Corresponding author: arifdsheikh@gmail.com

[†] These authors contributed equally to this work.

Abstract:

In the present investigation, a series of zinc ferrite (ZnFe₂O₄) nanoparticles were synthesized using a facile, reproducible and scalable chemical co-precipitation route for sunlight assisted photocatalytic degradation application. In the present work, we have prepared ZnFe₂O₄ with 1:1, 1:2 and 1:3 molar ratio of zinc chloride and ferric chloride respectively. This work reports the photodegradation of organic methylene blue dye molecules using ZnFe₂O₄ under both normal sunlight, and collected sunlight. Among other annealing temperatures, particularly the ZnFe₂O₄ annealed at 600 °C with a molar ratio of 1:3 showed the highest photocatalytic degradation of methylene blue. Interestingly close to 99 % degradation in less than 60 min of collected sunlight illumination has been achieved indicating maximum photocatalytic activity under investigation. This expounding study will open new way of light harvesting in the field of photocatalysis which is different from common praxis.

Keywords: ZnFe₂O₄, Photocatalysis, Natural Sunlight, Methylene blue, Photo-degradation, Co-precipitation, kinetics rate constant

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