



Indian Journal of Chemistry  
Vol. 63, November 2024, pp. 1112-1120  
DOI: 10.56042/ijc.v63i11.12828



## FeVO<sub>4</sub> nanoparticles: Powering synergistic hetero-Fenton photodegradation of methyl violet and enabling green chemical synthesis

S Thillainatarajan<sup>a</sup>, L Firthawsha Yasmin<sup>a</sup>, A Shalini<sup>b</sup>, K Deepa<sup>c</sup>, Krishnakumar Balu<sup>d,e</sup>, I Muthuvel<sup>a,f</sup>, Sabah Ansar<sup>g</sup>,  
T Rajachandrasekar<sup>a</sup>, G Thirunarayanan<sup>f</sup> & S Sivaselvan<sup>\*h</sup>

<sup>a</sup> Photocatalysis Laboratory, Department of Chemistry, M. R. Government Arts College, Mannargudi 614 001, Tamil Nadu, India

<sup>b</sup> Department of Chemistry, SRM Institute of Science and Technology, Ramapuram, Chennai 600 089, India

<sup>c</sup> Department of Chemistry, Chellammal Women's College, Chennai 600 032, Tamil Nadu, India

<sup>d</sup> Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences (SIMATS), Chennai 602 105, Tamil Nadu, India

<sup>e</sup> Departamento de Ingeniería y Ciencia de los Materiales y del Transporte, E. T. S. de Ingenieros, Universidad de Sevilla, Avda. Camino de los Descubrimientos s/n., 41092 Sevilla, Spain

<sup>f</sup> Advanced Photocatalysis Laboratory, Department of Chemistry, Annamalai University, Annamalainagar 608 002, Tamil Nadu, India

<sup>g</sup> Department of Clinical Laboratory Sciences, College of Applied Medical Sciences, King Saud University, P.O. Box 10219, Riyadh, 11433, Saudi Arabia

<sup>h</sup> Department of Physics, M. R. Government Arts College, Mannargudi 614 001, Tamil Nadu, India

E-mail: profsivaselvanphy@gmail.com, sivaselvan@mrgace.ac.in

*Received 29 July 2024; accepted (revised) 22 October 2024*

Various environmental problems have led to a shift in the way consumers go about their lives. Methyl violet (MV) being disposed of as a waste into water resources even in small quantities, creates certain hazards and environmental problems. FeVO<sub>4</sub> nanoparticles have been successfully synthesized by the reaction of Ferric nitrate and ammonium vanadate at 75°C for 1 h. It is then calcined at 500°C for 4 h. Characterization of FeVO<sub>4</sub> nanoparticles has been investigated by FTIR, XRD, SEM-EDS and colour mapping, and UV-DRS. The surface morphological study from SEM depicts rod-shaped particles with the formation of clusters. The photocatalytic activity of FeVO<sub>4</sub> has been studied by a heterogeneous Fenton-like process which is able to decompose the methyl violet effectively under UV-A light in the presence of a desired quantity of H<sub>2</sub>O<sub>2</sub>. The catalyst has been reused for multiple runs hence it can be used for economic industrial pilot studies and also the remarkable solid acidic nature of nano iron vanadate's catalytic activity is suitable for the synthesis of enones and sulphonamides.

**Keywords:** Methyl violet, Iron vanadate, Hetero-Fenton-like, Wastewater treatment, solid acid