K. K. Wagh Institute of Engineering Education and Research, Nashik

Department: Applied Science

Title of Activity: International Paper Presentations at AMSCA-2025, South Korea

Date: 25th – 27th June, 2025

Venue: Sungkyunkwan University, Suwon, South Korea

Four faculty members from K. K. Wagh Institute of Engineering Education and Research, Nashik—Dr. D.Y. Patil, Prof. S.S. Kahandal, Prof. R.S. Tupke, and Prof. I.S. Ingle—participated in the 5th International Conference on Advanced Materials Synthesis, Characterization, and Applications (AMSCA-2025), held at Sungkyunkwan University in Suwon, South Korea.

Their participation was made possible through an MoU signed between Sungkyunkwan University, South Korea, and K. K. Wagh Institute of Engineering Education and Research, Nashik, which has paved the way for academic collaboration, research exchange, and opportunities for faculty and students to engage on the global stage. This initiative highlights the institute's commitment to advancing research excellence and fostering international partnerships in the field of advanced materials and engineering sciences.

Paper Presentation Details:

Sr. No.	**Name of Staff**	**Title of paper**	**Journal/ Conference**	**ISSN Number**
1	Dr. D.Y. Patil	A Colorimetric "Turn-On" Chemosensor Based on Schiff Base for the Rapid and Selective Sensing of Cu^{2+}	Wiley Small/ AMSCA-2025	**1613-6810 (Print)** **1613-6829 (Online)**
2	Prof. S.S. Kahandal	Electrochemically Synthesized Nickel Selenide Thin Films for Electrocatalytic Overall Water Splitting Applications	Wiley Small/ AMSCA-2025	**1613-6810 (Print)** **1613-6829 (Online)**

3	Prof. R.S. Tupke	Hydrothermally Synthesized Nickel Selenide Nanomaterial for High Performance Supercapacitor Electrode	Wiley Small/ AMSCA-2025	**1613-6810 (Print)** **1613-6829 (Online)**
4.	Prof. I. S. Ingle	Theoretical Exploration of Non-Thermal Plasma Physics in Thin Film Deposition and Surface Modifications	Wiley Small/ AMSCA-2025	**1613-6810 (Print)** **1613-6829 (Online)**

Name of Staff: Dr. D.Y. Patil

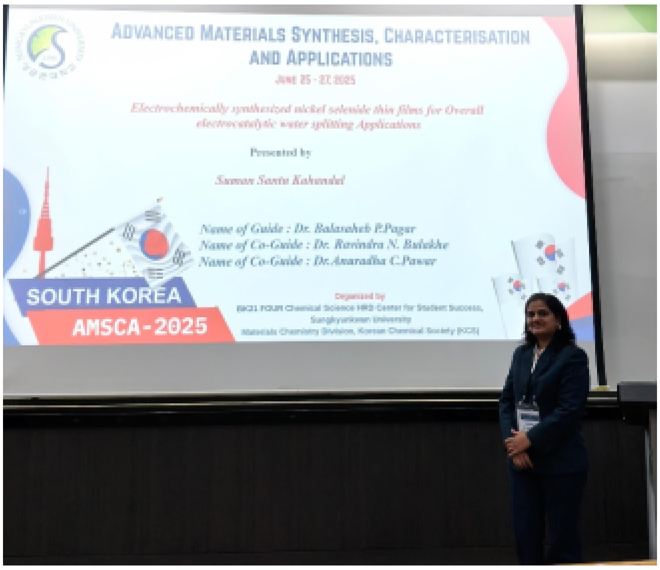
Paper Title: A Colorimetric "Turn-On" Chemosensor Based on Schiff Base for the Rapid and Selective Sensing of Cu^{2+}

Abstract: A novel "turn-on" colorimetric chemosensor, 3-(1H-benzo[d]imidazol-2-yl) quinolin-2-amine (SBL), was designed, synthesized, and characterized using benzene-1,2-diamine and a quinoline derivative. The chemosensor notably showed selectivity, sensitivity and quick response (within one minute) towards the Cu2+ ion in ethanol water (95:5 v/v) medium, amongst the other tested metal ions. Remarkably, the addition of Cu^{2+} induced a distinct colour change from colourless to yellow, enabling easy visual detection. The binding constant was calculated using Benesi-Hildebrand plot and was found to be 6.33×10^{3} M^{-1}. The limit of detection and limit of quantification was also evaluated and observed to be 8.01 x 10-7 M and 2.67 x 10-6 M respectively. Moreover, the binding stoichiometry of SBL with Cu2+ was determined to be 2:1 by Job's plot. This novel chemosensor SBL provided a new method for rapid and naked-eye recognition of Cu2+ with a cheap and easy-to-make process with high efficiency and stable storage.

Name of Staff: Prof. S.S. Kahandal

Paper Title: Electrochemically Synthesized Nickel Selenide Thin Films for Electrocatalytic Overall Water Splitting Applications

Abstract: Metal selenides have been attracted considerable interest as efficient electrocatalysts due to their tunable bandgap, diverse electronic characteristics, and multiphase structures with varying levels of conductivity. Herein, nickel selenide (Ni_3Se_2) thin films were prepared via electrodeposition in potentiostatic mode onto stainless steel substrates. Key deposition parameters—such as bath composition, pH, reactant concentrations, deposition duration, and applied potential—were systematically optimized to attain desirable film properties. The resulting electrodes were characterized for their physicochemical properties, using X-ray diffraction (XRD), scanning electron microscopy (SEM), and energy-dispersive X-ray spectroscopy (EDX). XRD results confirmed the formation of a cubic-phase Ni_3Se_2, while SEM images revealed a uniformly porous surface morphology. Additionally, the electrocatalytic activity of the synthesized electrode was thoroughly evaluated. Films were chemically synthesized for durations of 60 and 70 minutes. The as-synthesized films exhibited for Hydrogen evolution reaction (HER) overpotential values are 318 and 339 mV dec^{-1}, and for Oxygen evolution reaction (OER) 143 and 151 mV dec^{-1} for the 60- and 70-minute films, respectively.



Name of Staff: Prof. R.S. Tupke

Paper Title: Hydrothermally Synthesized Nickel Selenide Nanomaterial for High Performance Supercapacitor Electrode

Abstract: Hybrid supercapacitors require electrode materials with superior energy and power density for advanced energy storage applications. Bimetallic transition metal selenides, such as NiVSe, are promising due to their high conductivity and electrochemical activity. This study investigates the chemical synthesis of NiVSe-based electrodes using a hydrothermal method, conducted at a pH of 3 and a temperature of 180°C, with synthesis times of 12, 18, and 24 hours. The synthesis employs nickel and vanadium salts with a selenium source, adjusted to pH 3 to optimize reaction conditions. The hydrothermal process facilitates controlled nanostructure formation, influencing the material's electrochemical properties. The effects of synthesis time on NiVSe's structural, morphological, and electrochemical characteristics are examined using X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), cyclic voltammetry (CV), galvanostatic charge-discharge (GCD), and electrochemical impedance spectroscopy (EIS). These techniques assess crystal structure, particle size, morphology, specific capacitance, rate capability, and cycling stability. By varying synthesis duration, the study aims to identify optimal conditions for enhancing NiVSe's performance as a supercapacitor electrode. This research underscores the importance of tailoring synthesis parameters to develop high-performance electrode materials, contributing to the advancement of hybrid supercapacitors for sustainable energy solutions.

Name of Staff: Prof. I. S. Ingle

Paper Title: Theoretical Exploration of Non-Thermal Plasma Physics in Thin Film Deposition and Surface Modifications

Abstract: Non-Thermal Plasma or Cold Plasma has its enormous applications in areas like Agriculture, Chemical Conversions, Biomedical, as well as Surface Modifications. Key areas of experimental studies in the material sciences are focused on thin film synthesis, including Plasma Enhanced Chemical Vapor Deposition (PECVD) and Plasma Polymerization, as well as surface energy modifications in thin films involving modifications in the surface energy the thin film. Our theoretical study/review investigates the possibilities of such applications and most importantly, the understanding of the basic cold plasma physics processes, such as excitations and ionizations by high energy electrons, sheath dynamics and plasma-to-surface interaction. These same factors make it easy to fine tune the process to achieve control over the same, supposedly increasing the film growth. As far as surface modifications are considered, cold plasma acts in both ways; it could be used to increase the surface energy, as well as to decrease the surface energy. In other words, it could be used to increase as well as decrease the wettability of any given surface, or in this context, thin film. Such fundamental understanding of applications of cold plasma physics for thin film synthesis as well as surface modifications are being studied under this literature/paper.


1) Synthesis of very thin films (< 1 µm).
2) Precise control over electronic and molecular structures, nanostructure and permeability of the films by selecting appropriate precursors and conditions of the manufacturing process.
3) Obtaining complex structures through the use of co-deposition from two or more precursors in the PECVD process or deposition of sandwich-like systems.
Synthesized Films were used in processes such as volatile organic compounds (VOCs) combustion and studying OER
CoO
C/N
CoO
C/N
CoO
3 µm
Courtesy of Prof. Jacek Tyczkowski,
https://doi.org/10.1016/j.cattod.2019.03.037
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