

# Application of Molybdenum Selenide and its Graphene Oxide Composite Material in Photodegradation of Crystal Violet, Electrocatalytic Reduction and Photocatalytic Reduction of CO<sub>2</sub>

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## — Abstract —

The molybdenum selenide composite materials with varying percentages of graphene oxide (MoSe<sub>2</sub>/GO) were synthesized by a hydrothermal reaction. The material characteristics, energy bandgap size, and structural identification of the catalysts were determined using various techniques including XRD, FE-SEM-EDS, FE-TEM-EDS, UV-Visible/NIR, HP-XPS, BET, PL .

The efficiency of photocatalytic performance was assessed through the degradation of crystal violet dye. Among the MoSe<sub>2</sub>/GO composites, MoSe<sub>2</sub>/GO-10wt% exhibited the highest degradation efficiency for crystal violet. Furthermore, the catalytic performance of these composites for the photoreduction of carbon dioxide (CO<sub>2</sub>) to methane and other organic products was studied.To study CO<sub>2</sub> reduction reactions, different electrochemical experiments were conducted using a galvanostat.

Cyclic voltametric measurements in the voltage range of 0 V to -1.6 V to determine the optimal catalyst and reduction potential. subsequently, the catalyst’s performance was analyzed under galvanostatic conditions. The products were analyzed using gas chromatography with flame ionization detection (GC-FID). The results indicated that the MoSe<sub>2</sub>/GO-30wt% composite exhibited superior electrocatalytic performance, facilitating CO<sub>2</sub> reduction at lower voltages, primarily yielding ethanol and isopropanol as the main products.

## — Result and Discussion —

