Conversion of CO2 into valuable chemicals and fuels via photocatalytic reduction reaction by using MoS_2/MoO_3 nanocomposite heterostructure as catalyst.

The conversion of CO_2 towards hydrocarbon fuels via photocatalytic reaction, to solve the environment and energy problem, is a current topic under thorough investigation. The main phenomenon that enables CO_2 reduction is the bending, upon adsorption to a surface, of the molecule in a partially charged CO_2^- molecule with a lower LUMO and, therefore, a lower reduction energy. The most challenging part of the CO_2 reduction reaction is the selectivity due to the multielectron-transfer process, thus the photocatalysts used in CO_2 reduction reaction are of utmost importance. Among those already used as catalysts or co-catalysts, 2D materials such as MoS_2 have shown promising results for photocatalytic reaction of CO_2.

Here, we will show our recent work on 2D material-based nanocomposite for photocatalysis of CO_2 reduction reaction. In this study, 2D MoS_2 has been prepared by Chemical Vapor Deposition (CVD). Then, the MoO_3 powder is spin coated with different parameters, e.g., temperatures, times, etc. on top of the MoS_2 nanoflakes. The heterostructure MoS_2/MoO_3 was used as catalyst for CO_2 reduction to chemicals. The prepared material has been characterized for structural, optical, chemical, electrochemical, and photocatalytic properties towards the selective reduction of CO_2 to chemical fuel.