UAEU جامعة الإمارات العربية المتحدة United Arab Emirates University

The College of Graduate Studies and the College of Science Cordially Invite You to a

Master Thesis Defense

Entitled

SYNTHESIS, CHARACTERIZATION, ELECTRONIC STRUCTURE OF R-GO AND NH_2-MIL-125(TI) MODIFIED $BINBO_4$ AND THEIR PHOTOCATALYTIC ACTIVITIES

By

Maram Yahya Bakiro

Faculty Advisor

Dr. Ahmed Alzamly, Department of Chemistry

College of Science

Date & Venue

2:00 PM

Thursday, 16 April 2020

https://eu.bbcollab.com/guest/40f0dc73f333417cb6071b6b1dde5926

Abstract

The aim of this thesis is to design and synthesize novel visible light photocatalysts for CO_2 utilization. In recent years, Bi-based materials have shown remarkable photocatalytic activity in the field of CO_2 reduction. Particularly, $BiNbO_4$ has many promising applications as a visible light harvesting material due to its band gap position and orbital hybridization. In this thesis, an intensive effort has been made to study the effect of different reaction parameters such as temperature and pH of different synthetic methodology applied. The new photocatalytic materials have been characterized using different characterization techniques including PXRD, BET, SEM, EDX and UV-Vis DRS. Since the activity of $BiNbO_4$ is limited due to high recombination rate of the photogenerated electron-hole pairs and the low surface area, to minimize this effect, reduced graphene oxide modified $BiNbO_4$ composite material was fabricated using hydrothermal mixing. Moreover, Ti-based amine functionalized metal organic frameworks (MOFs) modified $BiNbO_4$ hybrid material was also prepared. The activity of prepared $BiNbO_4$ /r-GO heterojunction photocatalysts was examined for the cycloaddition of CO_2 with propylene oxide as a photocatalytic model reaction. Interestingly, no polymeric material was formed and selective cyclic propylene carbonate in high yield was obtained, with the highest yield obtained when using 5% r-GO by mass. Furthermore, the activity of $BiNbO_4$ / NH_2-MIL-125(Ti) was found to be increased upon the addition of 50 % NH_2-MIL-125(Ti) by mass.

Keywords: $BiNbO_4$, photocatalysis, light harvesting, reduced graphene oxide (r-GO), metal organic framework (MOF), carbon dioxide.