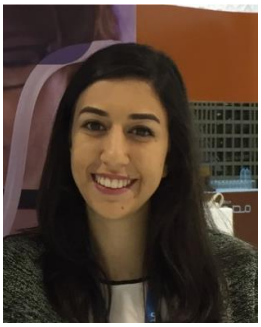
PhD Candidate Profile



Name:
Samar Al Jitan

Research Group:
Photocatalysis Group

Research Centre:
Research and Innovation centre on CO_2 and H_2 (RICH)

Department/School(s):
Department of Chemical Engineering

College:
Khalifa University, Abu Dhabi, U.A.E.

Supervisor(s):
Dr. Giovanni Palmisano

Funding body:
Department of Education and Knowledge (ADEK), Abu Dhabi, U.A.E.

Area (field) of study:
Photoreduction of CO_2 into value-added organic species

Thesis Title:
Core-shell (Pt/Cu-TiO_2)-graphene composites for photocatalytic conversion of CO_2 into fuel

Abstract:
The global emission of greenhouse gases continues to rise by about 3% each year. Higher atmospheric concentrations of greenhouse gases lead to surface warming of the land and oceans consequently initiating a set of catastrophic environmental impacts, including the melting of glaciers, rising sea levels, longer droughts, more forest fires, stronger tropical storms, larger downpours of rain and snow, etc. Although carbon capture and sequestration (CCS) technologies may appear to be very promising in removing excess CO_2 from the atmosphere, they are expensive and energy intensive. To make CCS technologies more economically feasible, carbon capture and utilization (CCU) technologies have emerged.

Atmospheric CO_2 may be utilized by converting it into different value-added products, such as methane, methanol, ethanol and heavier hydrocarbons. Unlike other CO_2 conversion techniques, photocatalysis takes place at room temperature and under atmospheric pressure conditions, utilizes a renewable and sustainable form of energy and doesn't increase net CO_2 emissions. Since CO_2 is a highly stable and a relatively inert molecule, its recycling is a challenging task. Therefore, CO_2 reduction requires highly efficient catalysts, significant energy requirements and optimized reaction conditions.

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The main objective behind my study is to synthesize a TiO_2-based photocatalyst that can efficiently reduce CO_2 to fuels under light irradiation. Surface modifications to help enhance the visible light absorption and the charge separation of TiO_2 catalysts were pursued. More specifically, the TiO_2 catalyst was doped with copper, photodeposited with platinum and impregnated with reduced graphene oxide. The improved TiO_2 photocatalyst was then tested for the photoreduction of CO_2 under different reaction conditions. Various material characterization techniques, including XRD, Raman, DRS, PL, SEM and TEM, were also applied. Finally, gas-phase and liquid-phase products from the different photoreactivity tests were analyzed using GC and HPLC, respectively.

Collaborations:

N/A

Publications:

S. A. Jitan, S. AlKhoori, M. Ochsenkühn, S. A. Amin, and L. F. Yousef, "Ethanol/water extracts from halophyte species Arthrocnemum macrostachyum and Tetraena qatarensis," Cogent Chemistry, vol. 4, pp. 1-6 (2018).

S. Al Jitan, S. A. Alkhoori, and L. F. Yousef, "Phenolic Acids From Plants: Extraction and Application to Human Health," in Studies in Natural Products Chemistry, vol. 58, ed: Elsevier, pp. 389-417 (2018).

Presentations:

6th European Conference on Environmental Applications of Advanced Oxidation Processes (EAAOP-6). Portorose, Slovenia, 26-30 June 2019.