

## Abstract

Highly water-dispersible cerium doped titania nanoparticles deposited reduced graphene oxide (Ce-TiO<sub>2</sub>/RGO) has been prepared by a hydrothermal technique. The uniform deposition of Ce-TiO<sub>2</sub> on RGO increases the absorption of titania from ultraviolet to visible region. From the photocurrent study, it was found that the optimum deposition of 0.2% cerium doped titania with 10 wt% RGO significantly increases the photocurrent density under visible light. During the photocatalytic process, the generated active species can be detected by trapping reactive species in presence of different scavengers. It was observed that h<sup>+</sup> and <sup>•</sup>O<sup>2-</sup> are responsible for the photocatalytic action of the composite. The developed heterogeneous photocatalyst has more degradation efficiency for a cationic dye methylene blue, and two pesticides quinalphos and imidacloprid as compared to conventional TiO<sub>2</sub> catalyst under visible light. Incorporation of Ce into TiO<sub>2</sub> imparts bifunctional properties such as degradation of toxic pesticides and antimicrobial property against human pathogenic bacteria.

## Introduction

- With the increase in human population, water contamination has become a universal issue which brings a serious impact on human existence and the ecological system
- Organic dyes, herbicides, pesticides, and pathogenic bacteria are the major contributors to water contamination.
- Needs to develop an efficient purification technology that can remove organic contaminants and pathogenic bacteria from water.



## Synthesis of 0.2Ce-TiO<sub>2</sub>/RGO

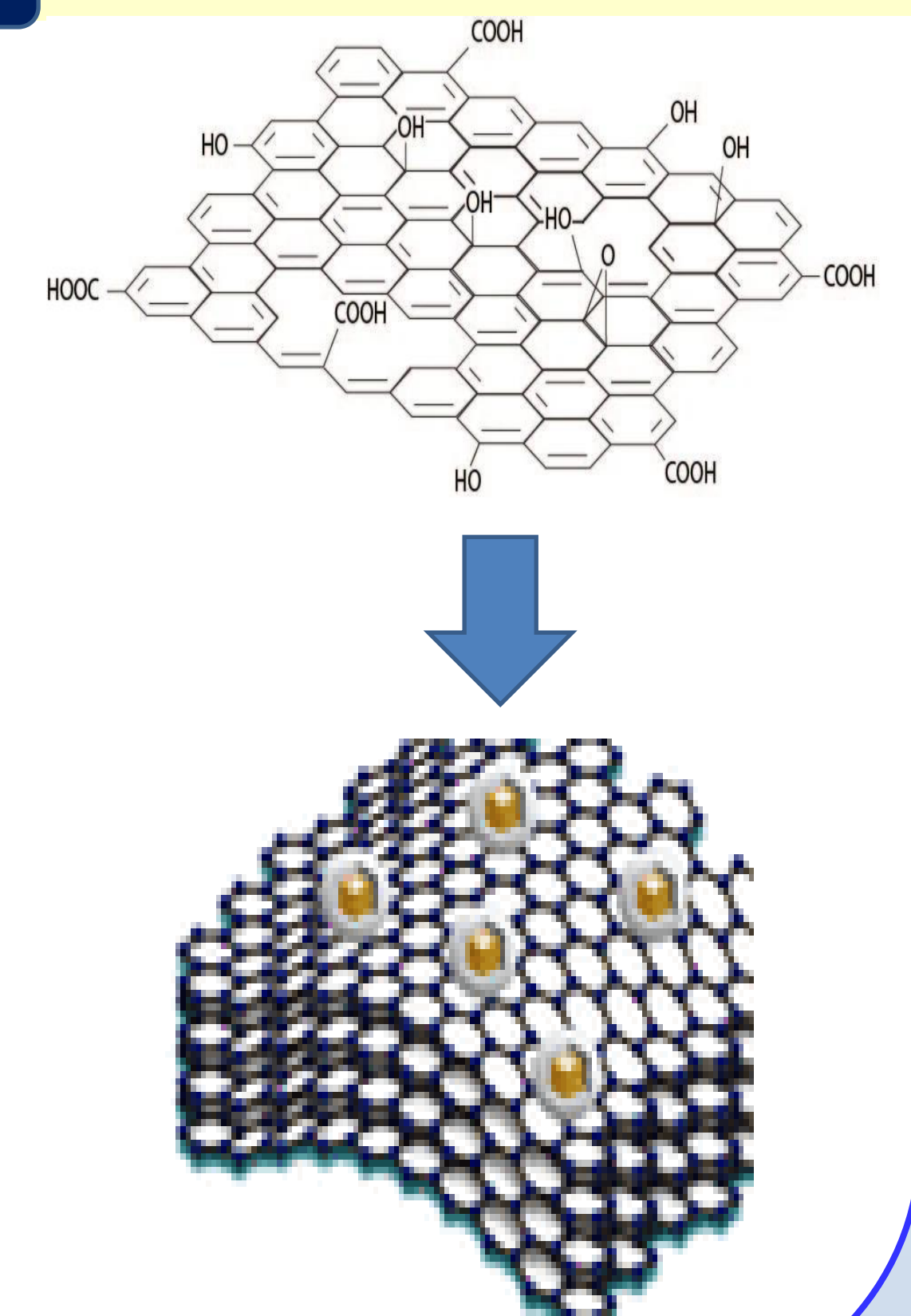
Graphene oxide(GO) synthesis by Hammers Method.

Then GO is converted to RGO.

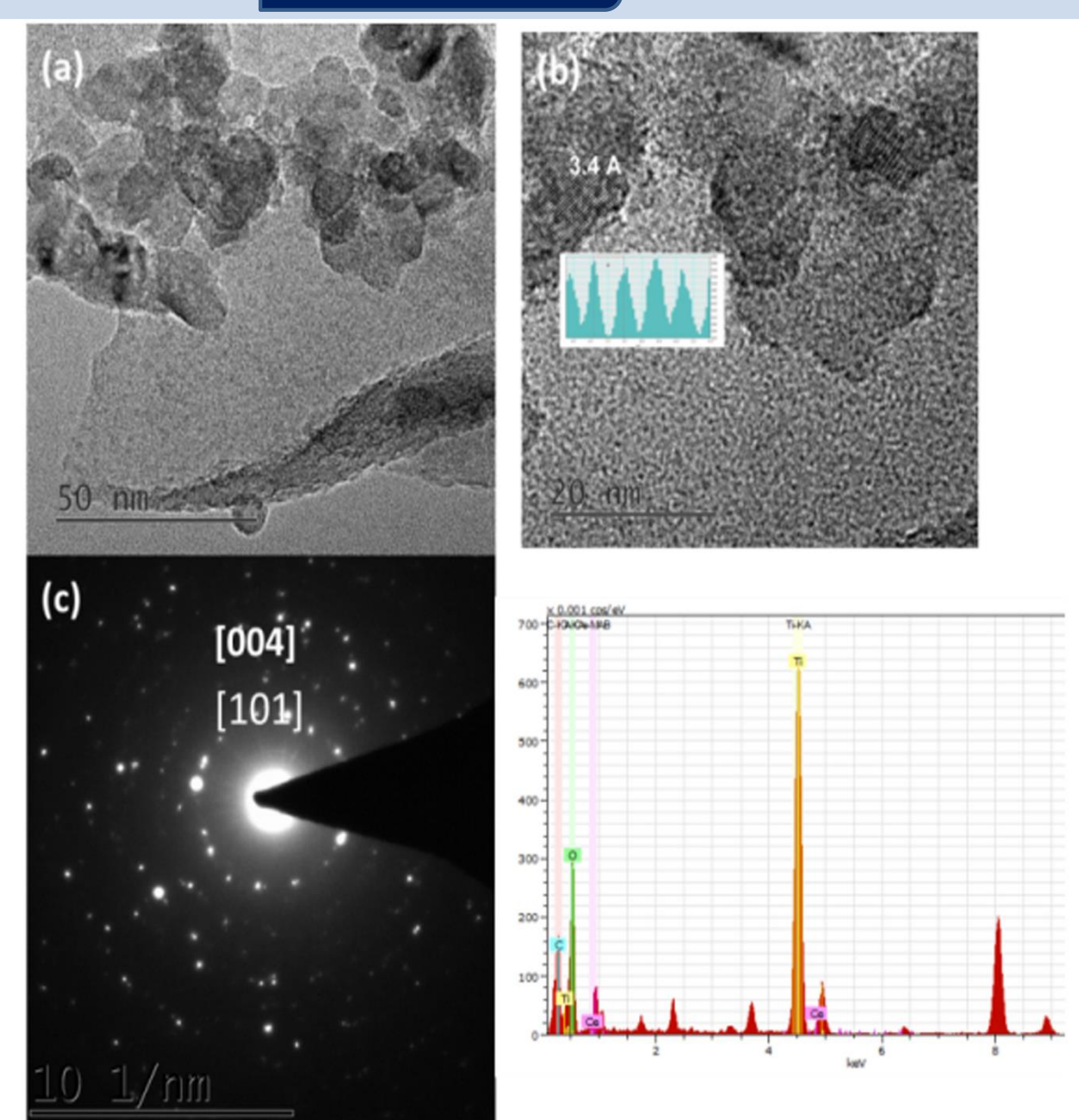
Ce-TiO<sub>2</sub> synthesis by taking TTIP and cerium nitrate precursor.

Simply deposition of Ce-TiO<sub>2</sub> in to the RGO sheet.

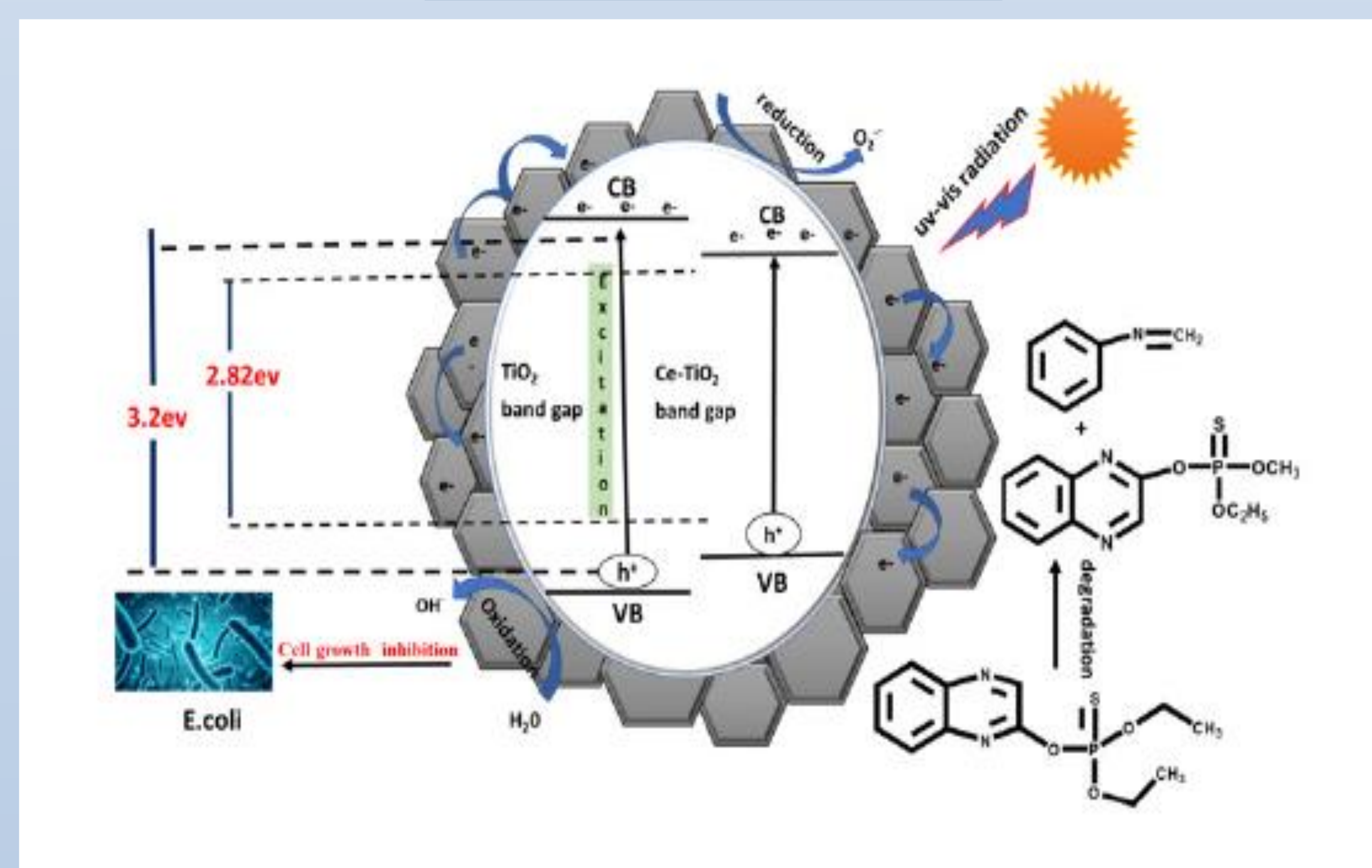
Optimization of Ce-TiO<sub>2</sub>/RGO



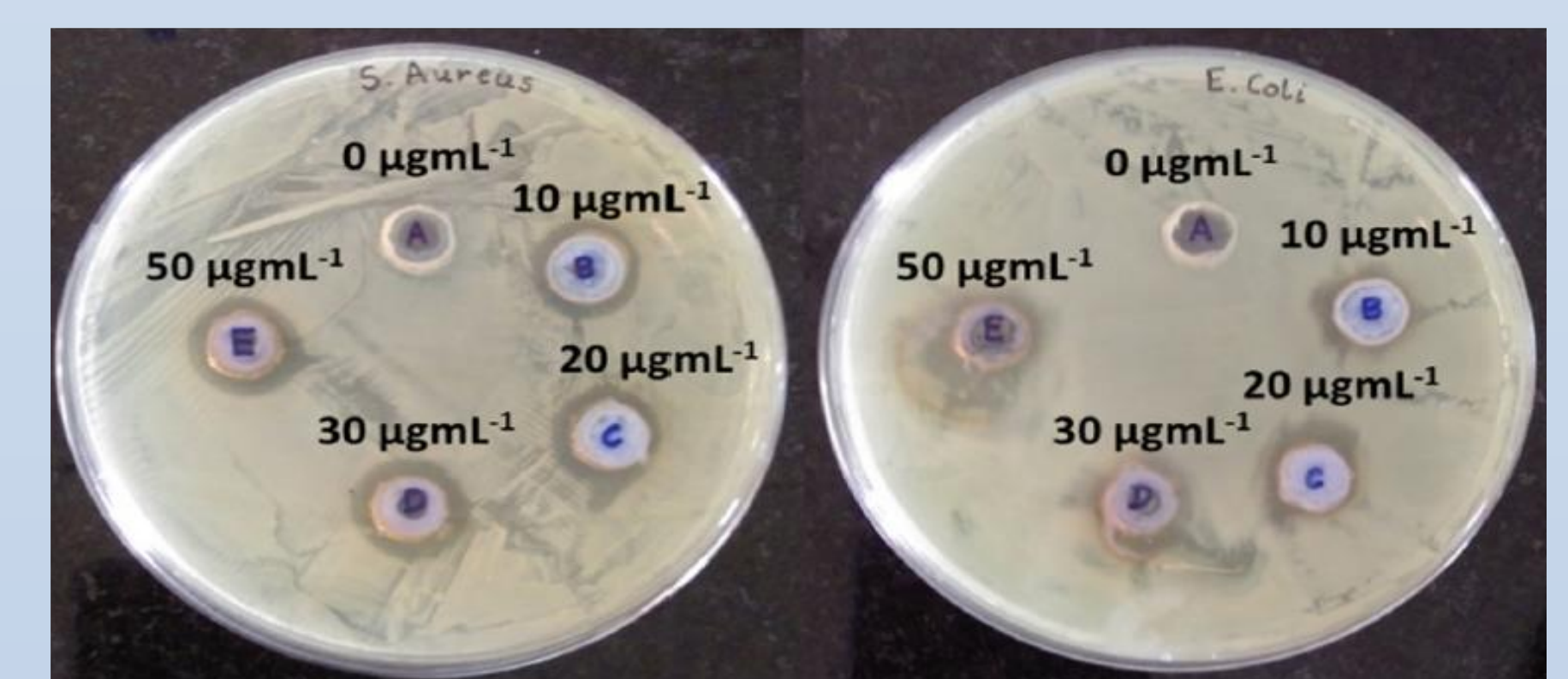
## Morphology



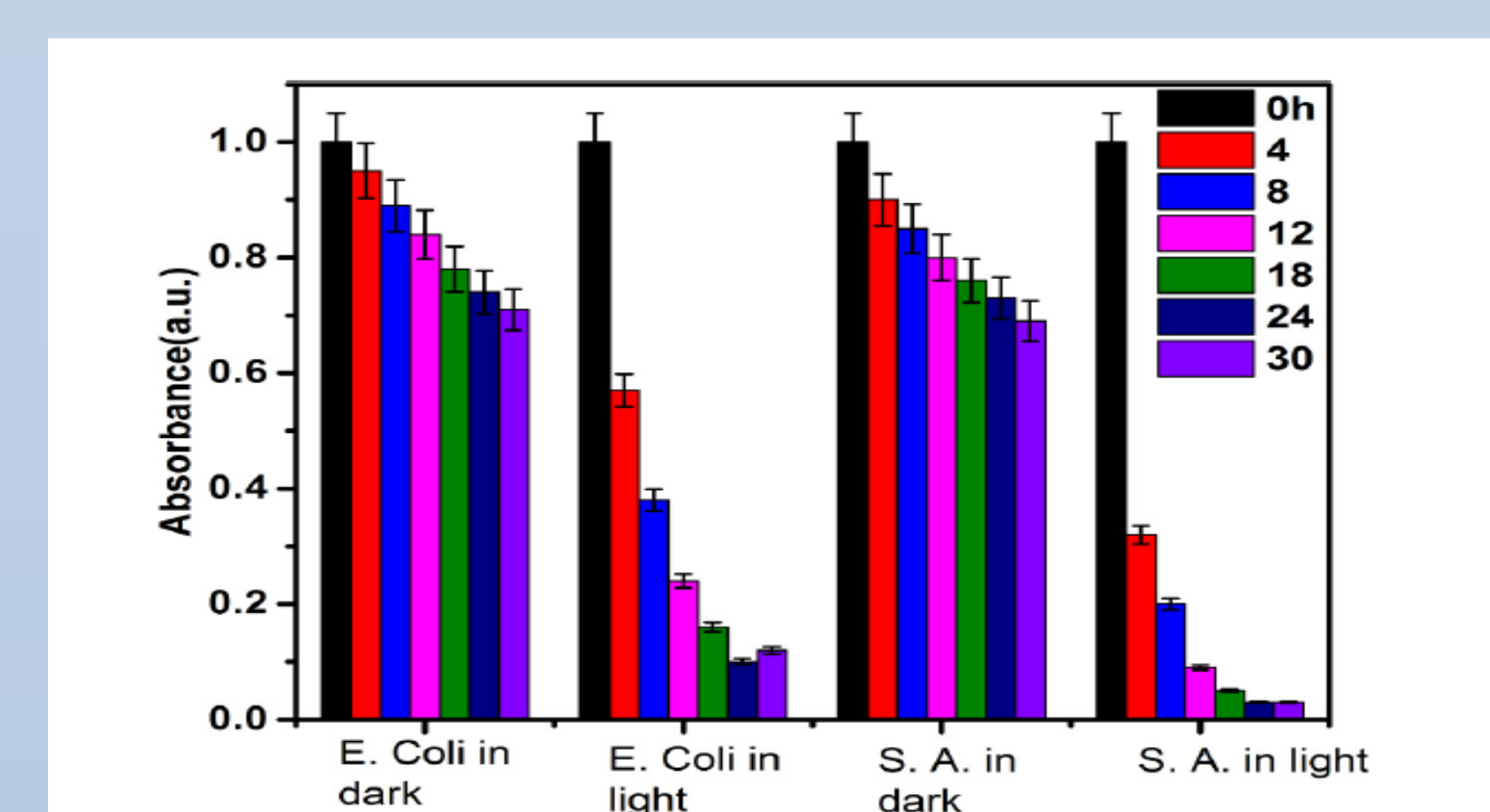
## Mechanism of Degradation



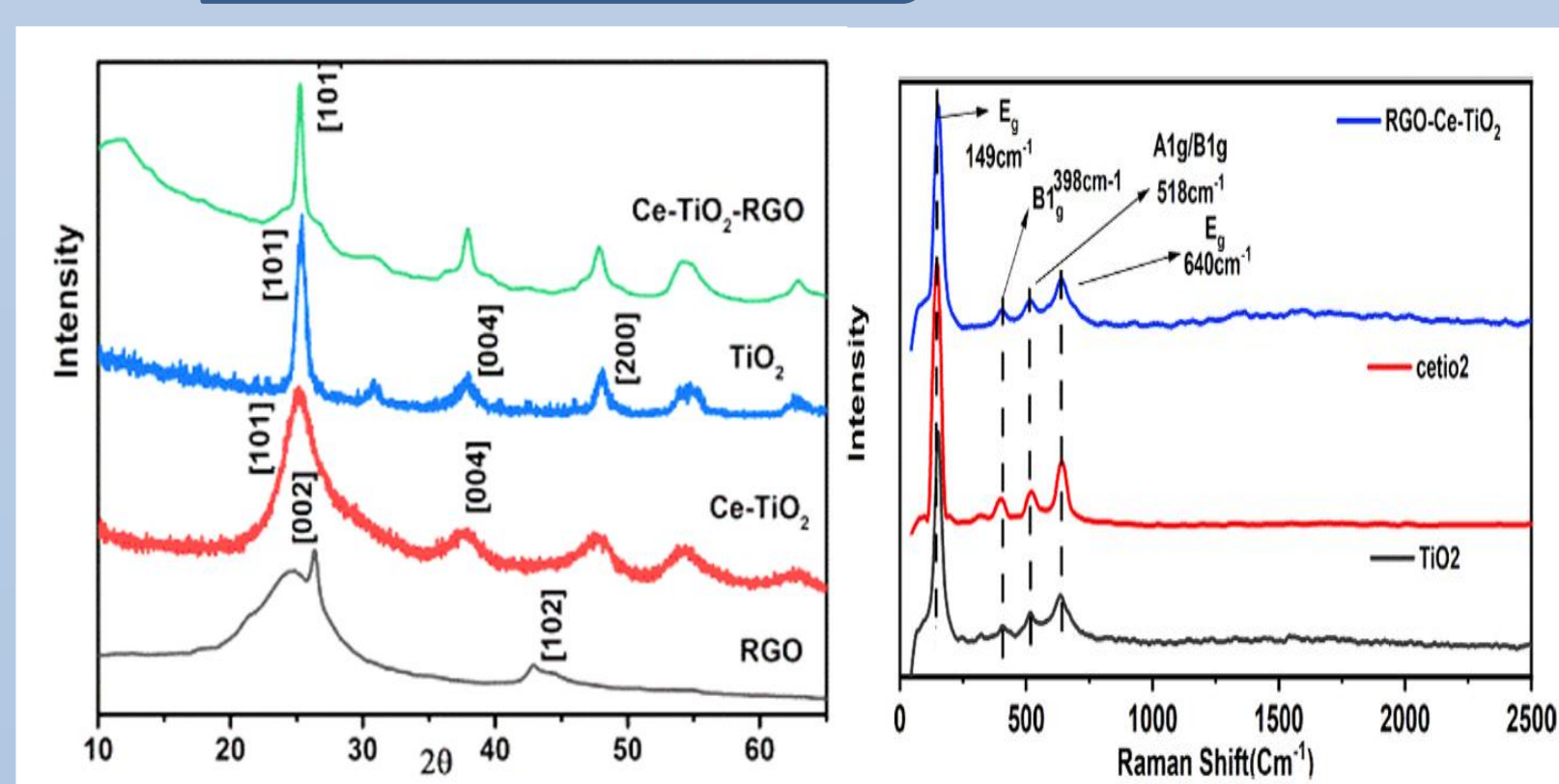
## Antibacterial activity



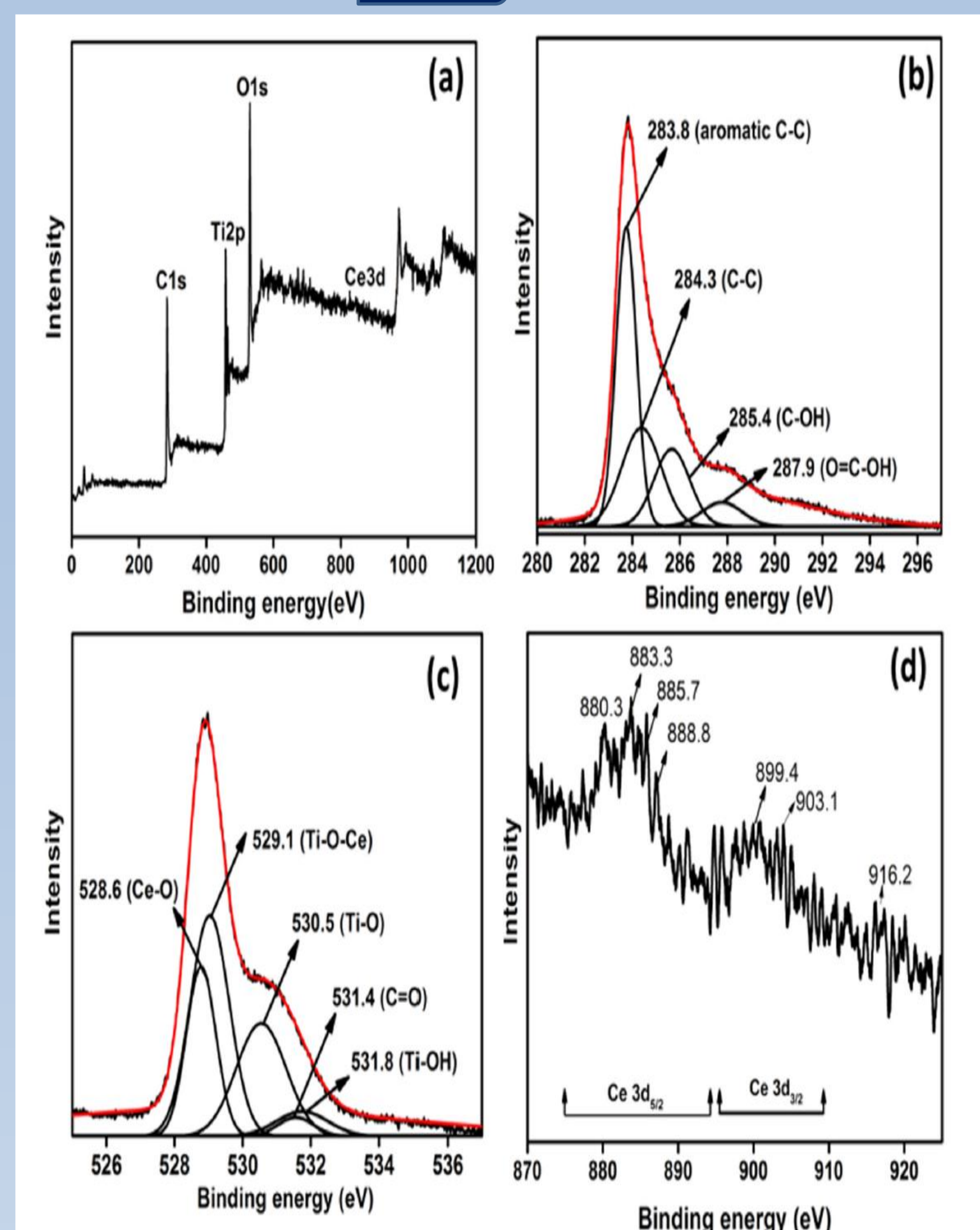
## Cell growth inhibition of bacterial cells



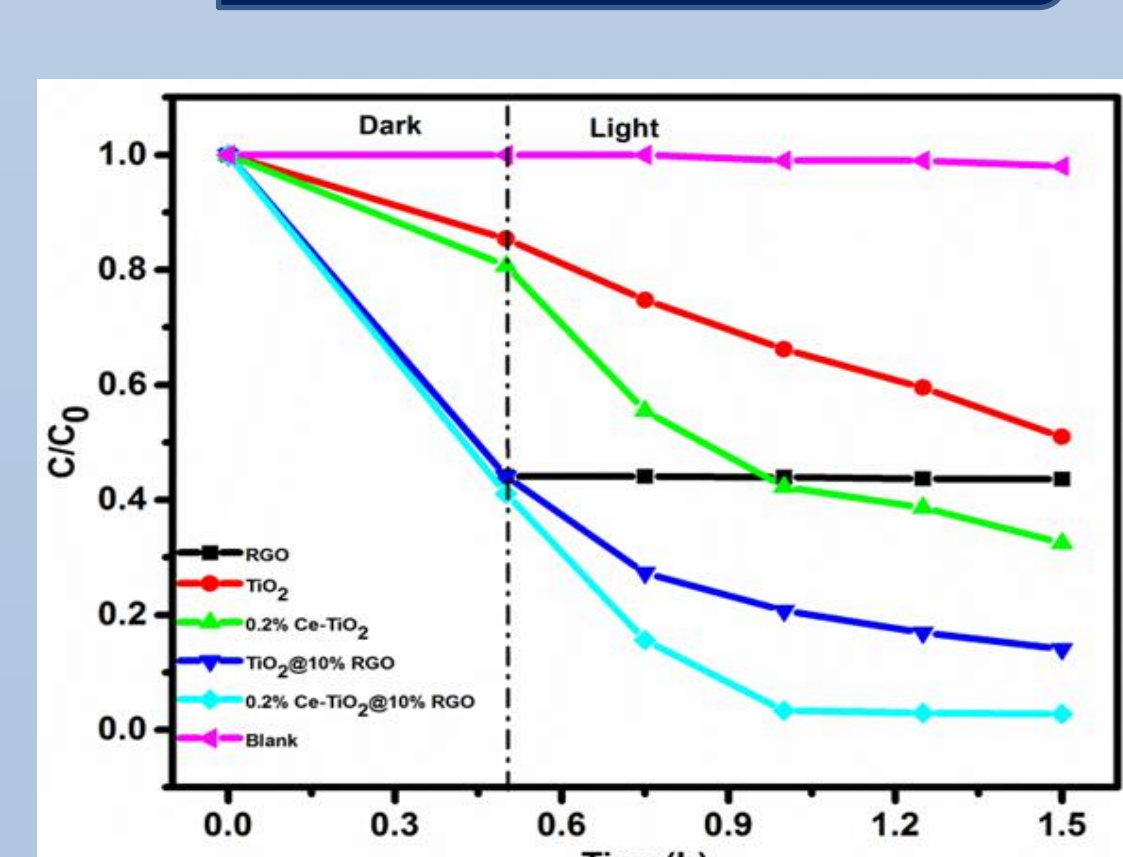
## XRD and Raman



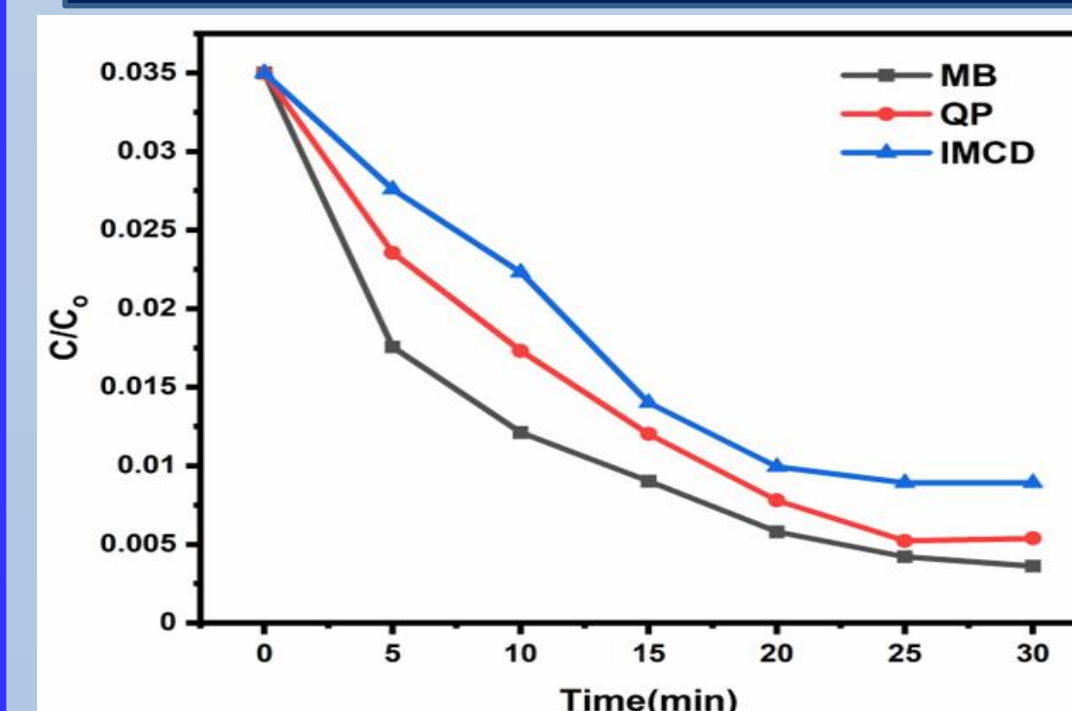
## XPS



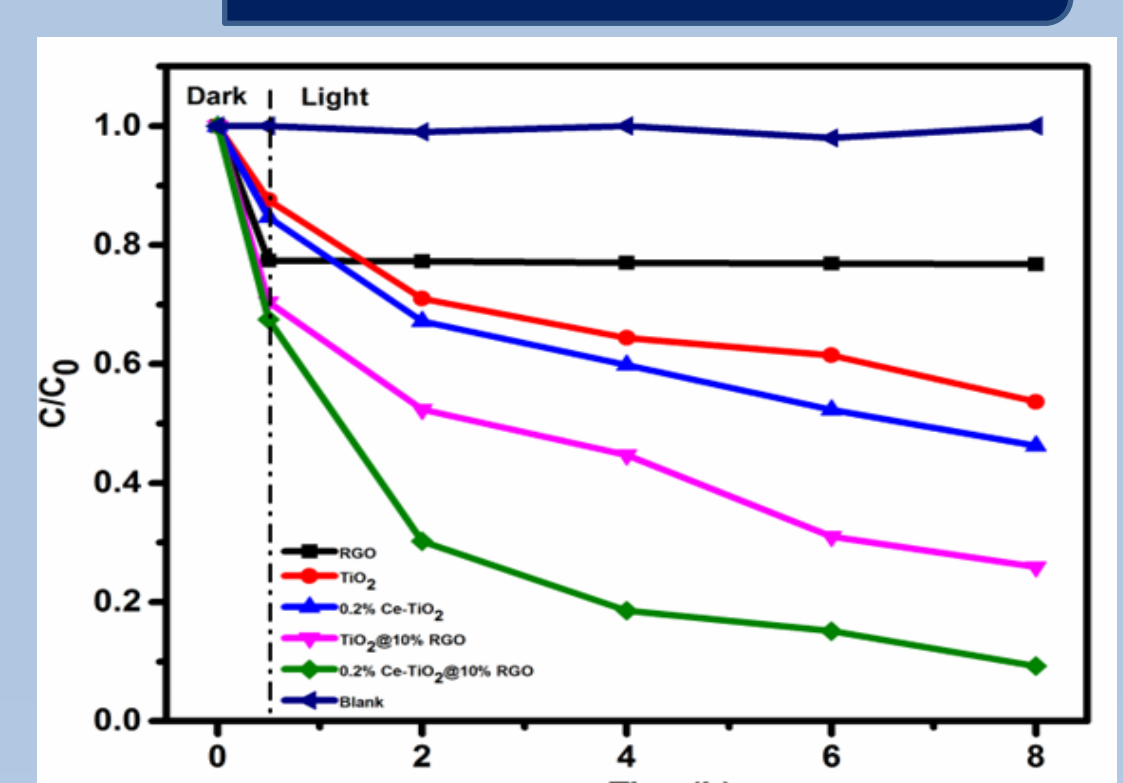
## Degradation of MB



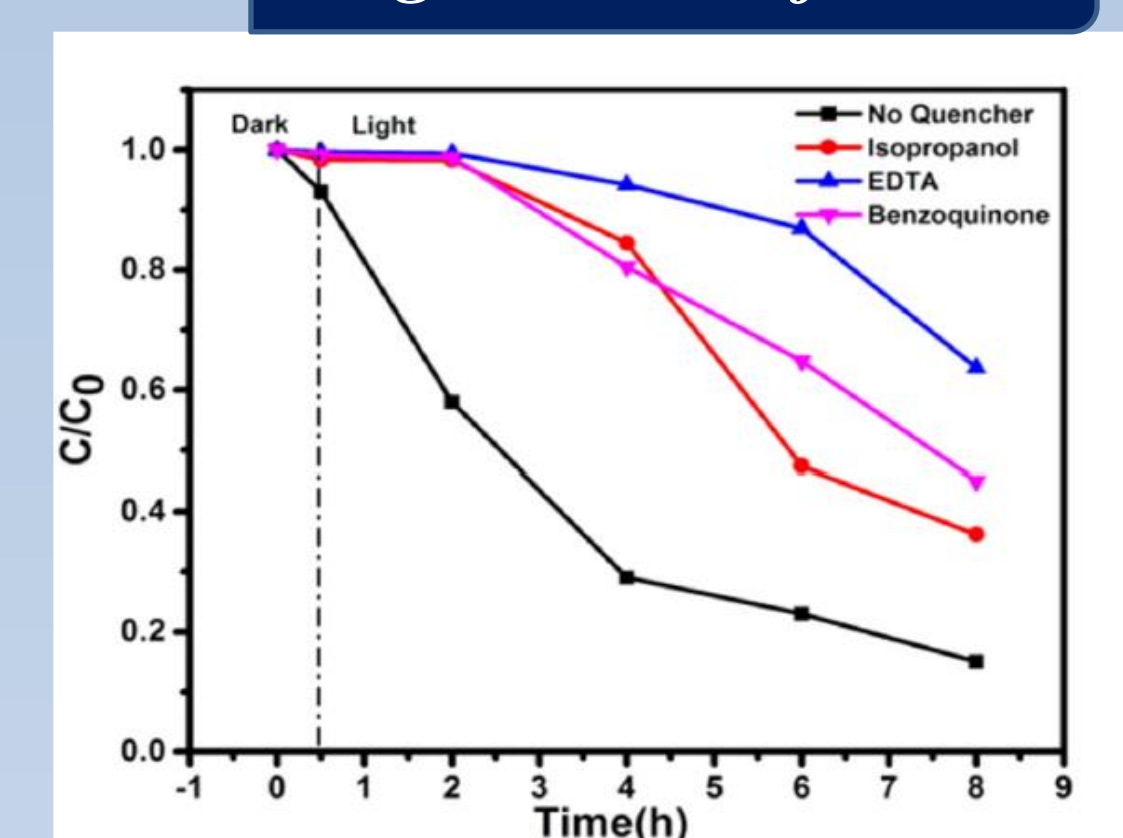
## Degradation profile with time in dark and light



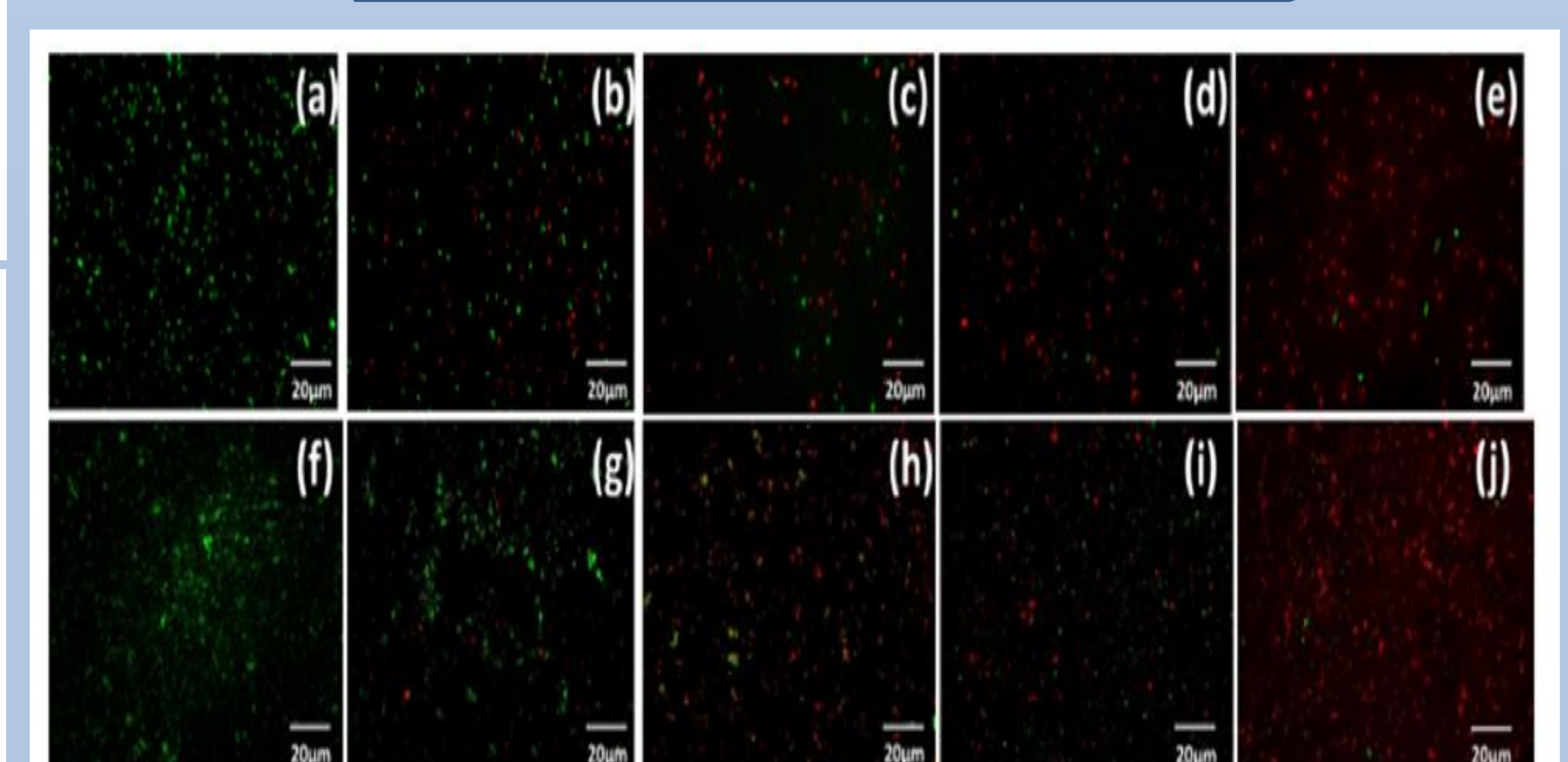
## Degradation of QP



## Degradation of IMD



## LIVE /DEAD Baclight assay images



## Conclusion

- The present work demonstrates the fabrication of uniformly 0.2Ce-TiO<sub>2</sub> deposited RGO by hydrothermal method.
- 0.2Ce-TiO<sub>2</sub>@10%RGO shows absorption in the visible range and shows very good performance in the photocatalytic degradation of three pesticides imidacloprid, quinalphos and methylene blue.

## References

1. M.A. Montgomery, M. Elimelech, Water and Sanitation in Developing Countries: Including Health in the Equation, ACS Publications, 2007.

## Acknowledgement