

Facile synthesis of ZnO-CuO, ZnO-Co₃O₄, CuO-Co₃O₄ and ZnO-CuO-Co₃O₄ nanocomposites : Characterization and Photocatalytic Study On Organic Dye

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MATERIAL SELECTION

Co₃O₄

- ✓ Band gap ~1.7–2.3 eV
- ✓ used in electrochemical sensors, electrodes, and magnetic materials.

ZnO

- ✓ Bandgap - 3.1–3.3 eV
- ✓ Potential for antibacterial, drug delivery, and photocatalytic applications.

CuO

- ✓ Narrow bandgap
- ✓ Excellent catalytic properties
- ✓ Synergistic behavior in composite systems
- ✓ Enhancing stability and photoactivity.

WHY PHOTOCATALYTIC DEGRADATION?

The photocatalytic degradation process has substantiated the most sustainable and effective technique due to its advantages such as:

- ✓ low cost
- ✓ acceptance
- ✓ green
- ✓ chemical stability
- ✓ high efficiency

OBJECTIVES

- To synthesize ZnO/CuO, ZnO/Co₃O₄, CuO/Co₃O₄ and ZnO/CuO/Co₃O₄ nanocomposite using co-precipitation method.
- To characterize synthesized nanocomposites by UV-Vis, FT-IR, XRD, FE-SEM and EDX.
- To study the photocatalytic activity of the composites and the effect of Initial dye concentration, amount of catalyst dosage and irradiation time on the photocatalytic degradation of MB dye.

MATERIALS AND METHOD

- ✓ Cobalt chloride hexahydrate (CoCl₂·6H₂O)
- ✓ Zinc Nitrate Hexahydrate (Zn(NO₃)₂·6H₂O)
- ✓ Cupric nitrate Trihydrate (Cu(NO₃)₂·3H₂O)
- ✓ Sodium Hydroxide (NaOH)
- ✓ Methylene Blue Dye

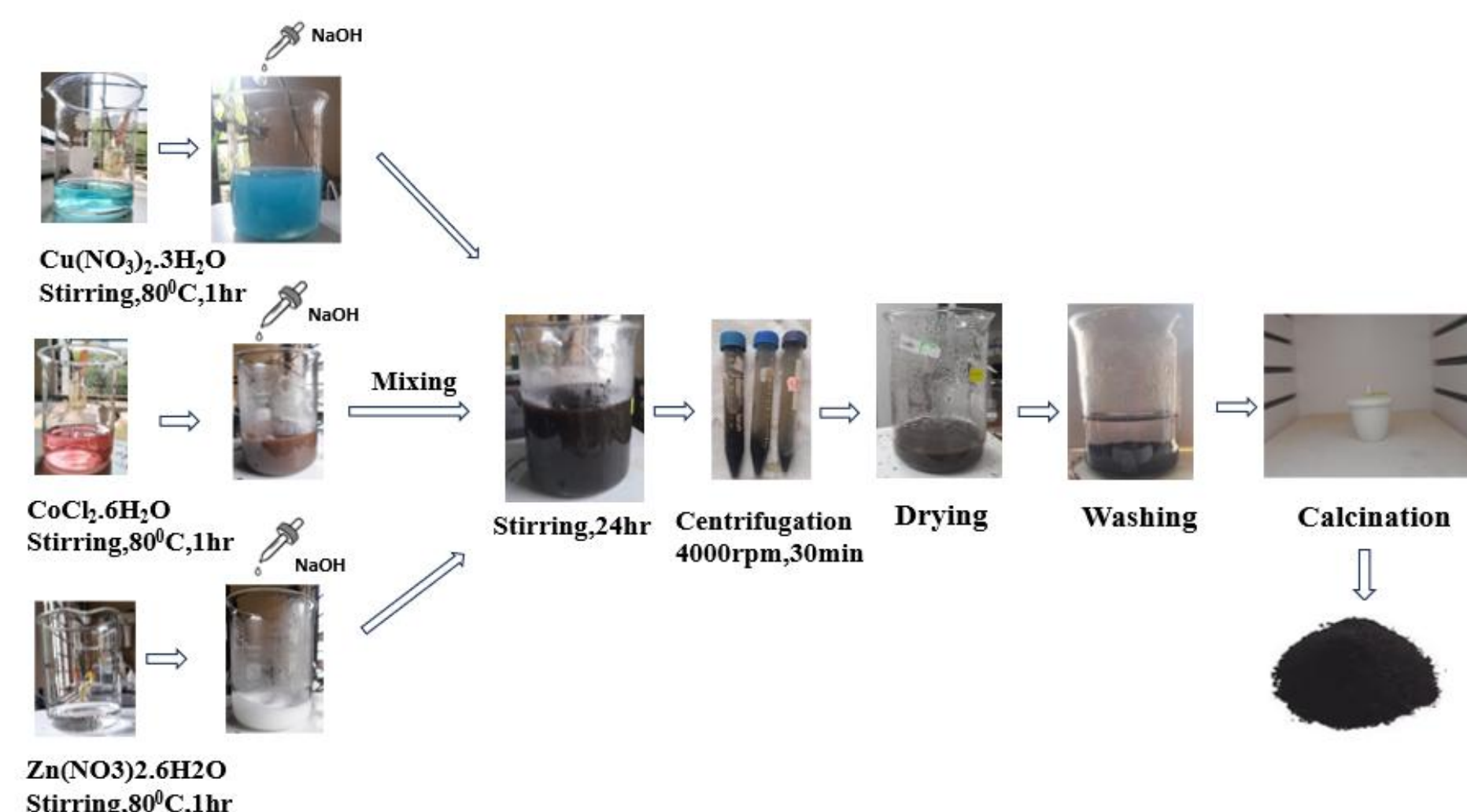
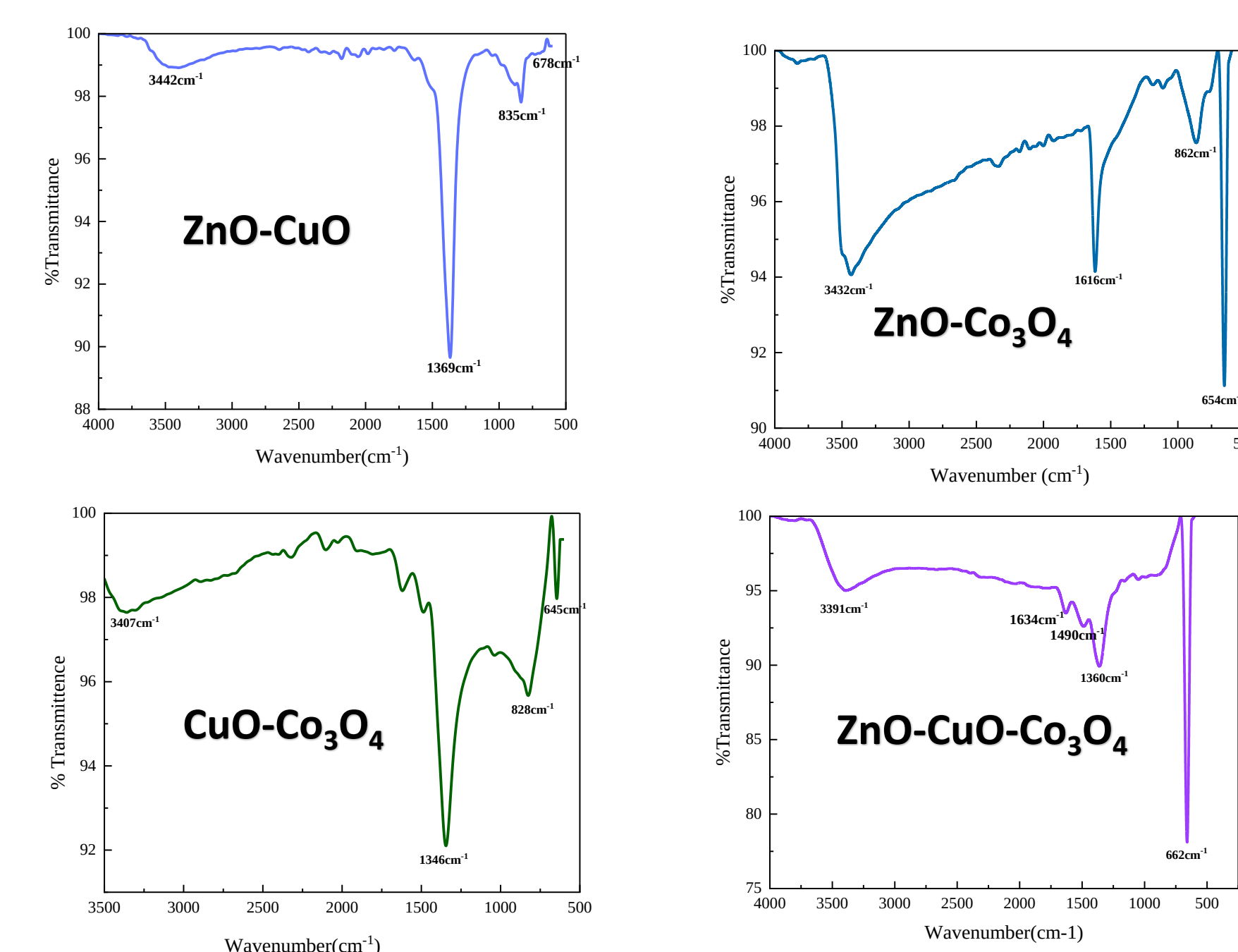


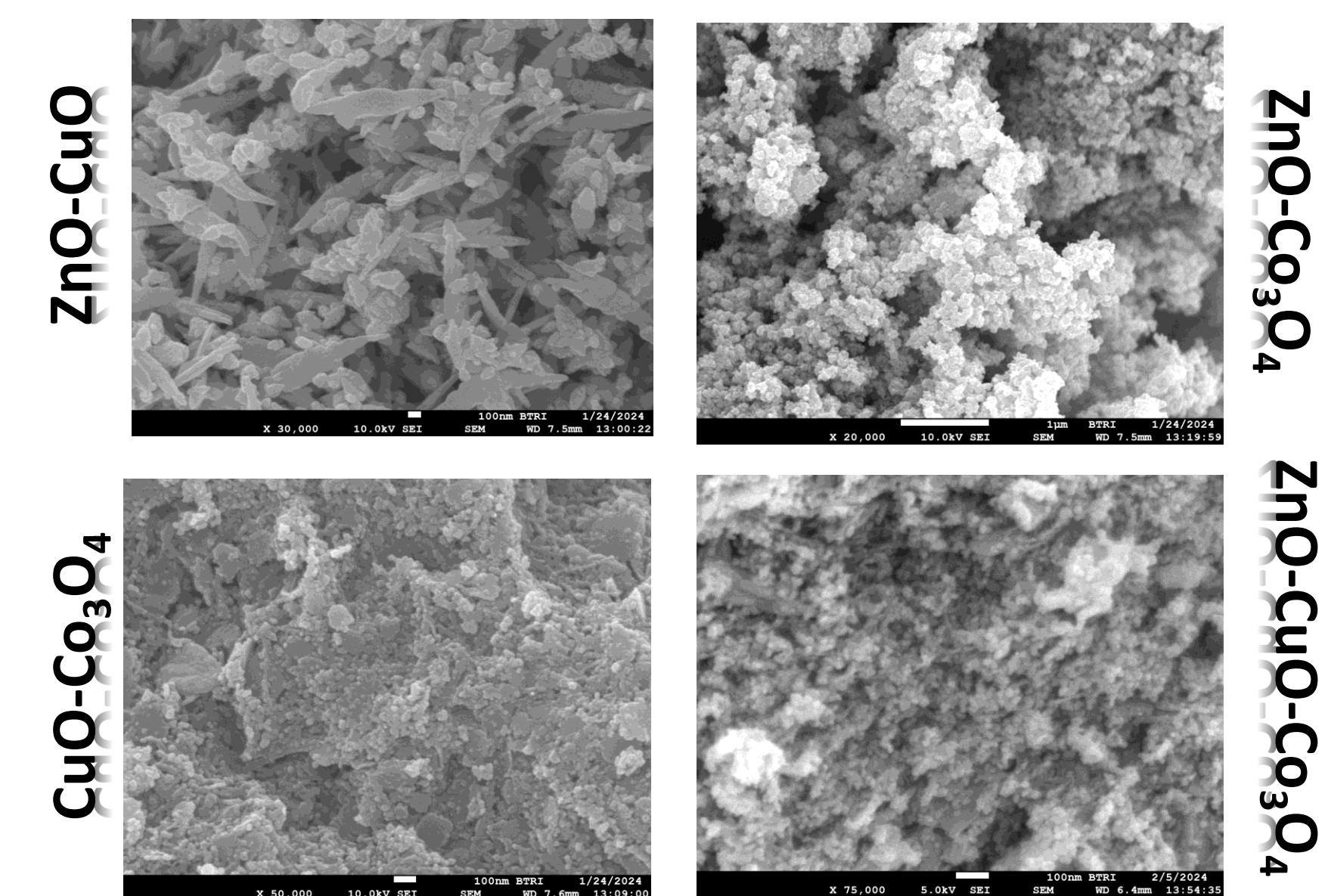
Fig 1 : Synthesis of ZnO/CuO/Co₃O₄ nanocomposites

CHARACTERIZATION

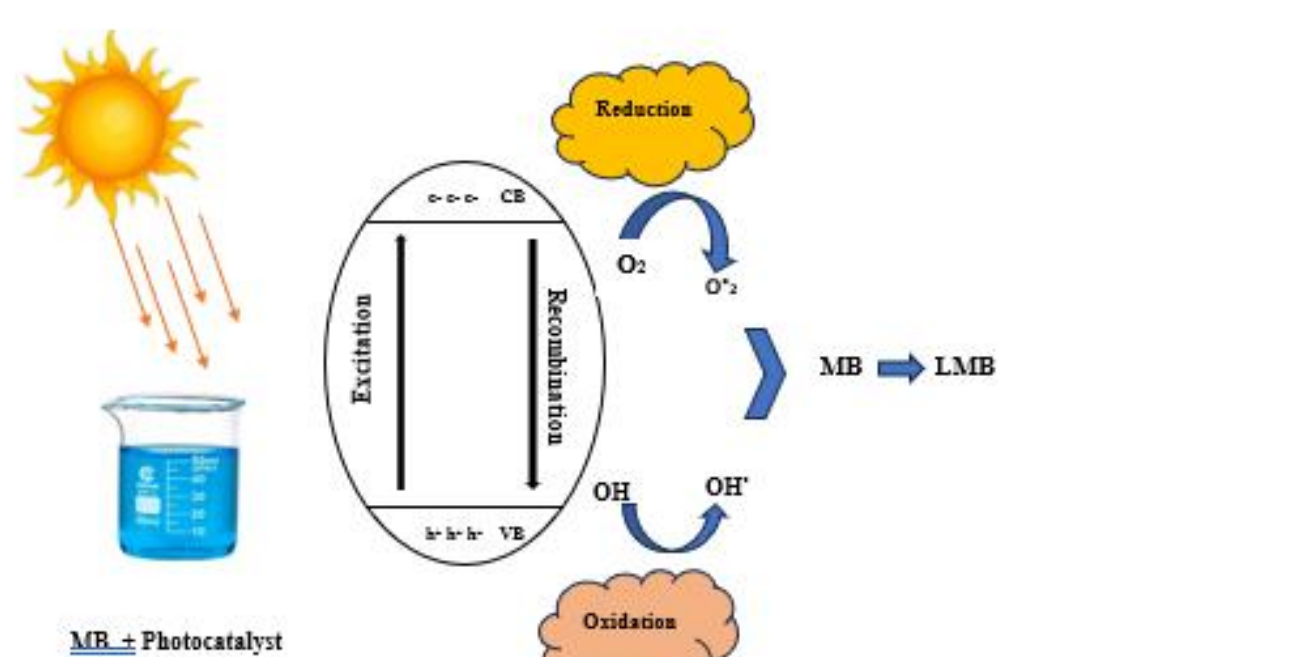
INFRARED SPECTROSCOPY



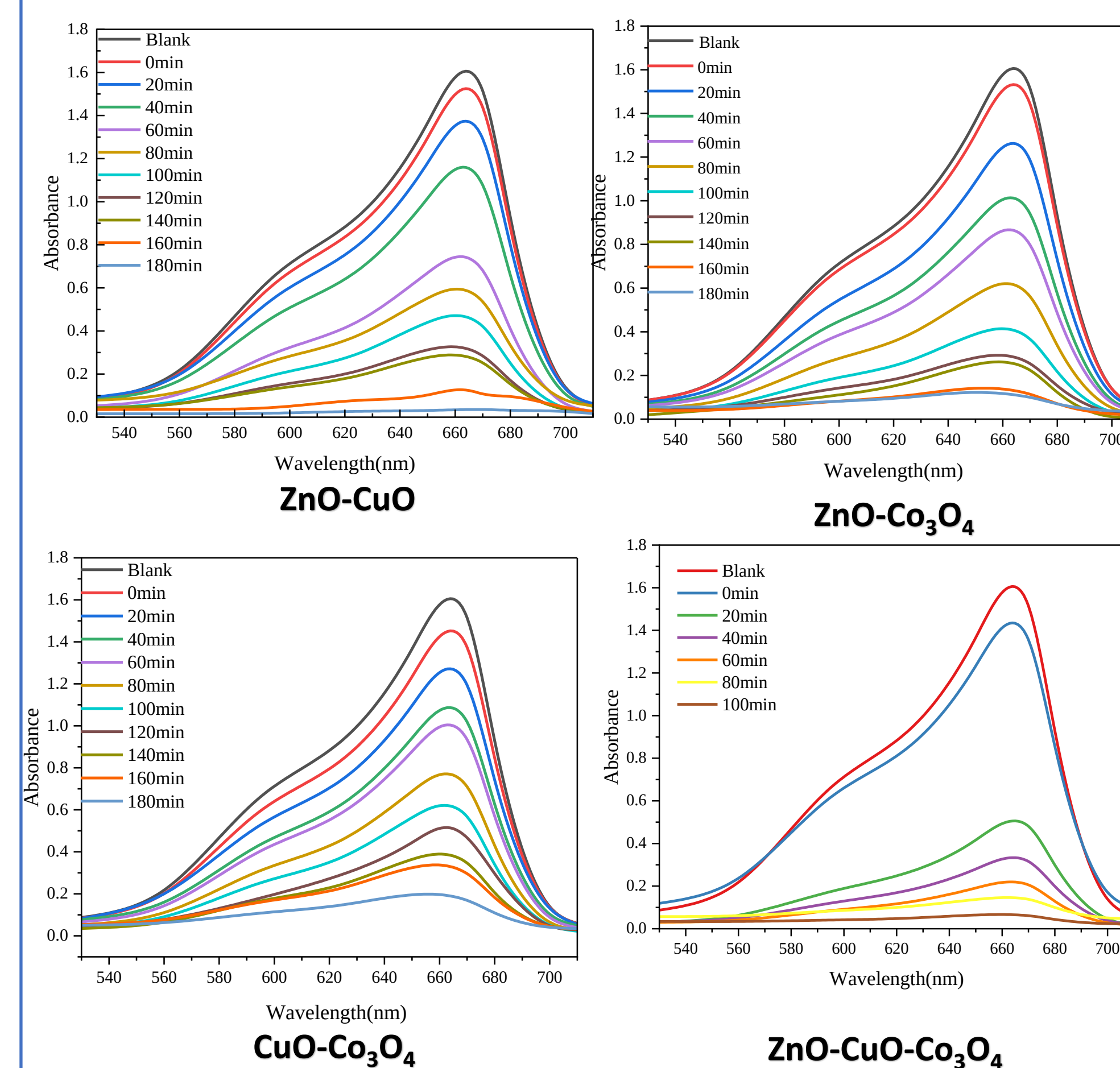
SCANNING ELECTRON MICROSCOPE



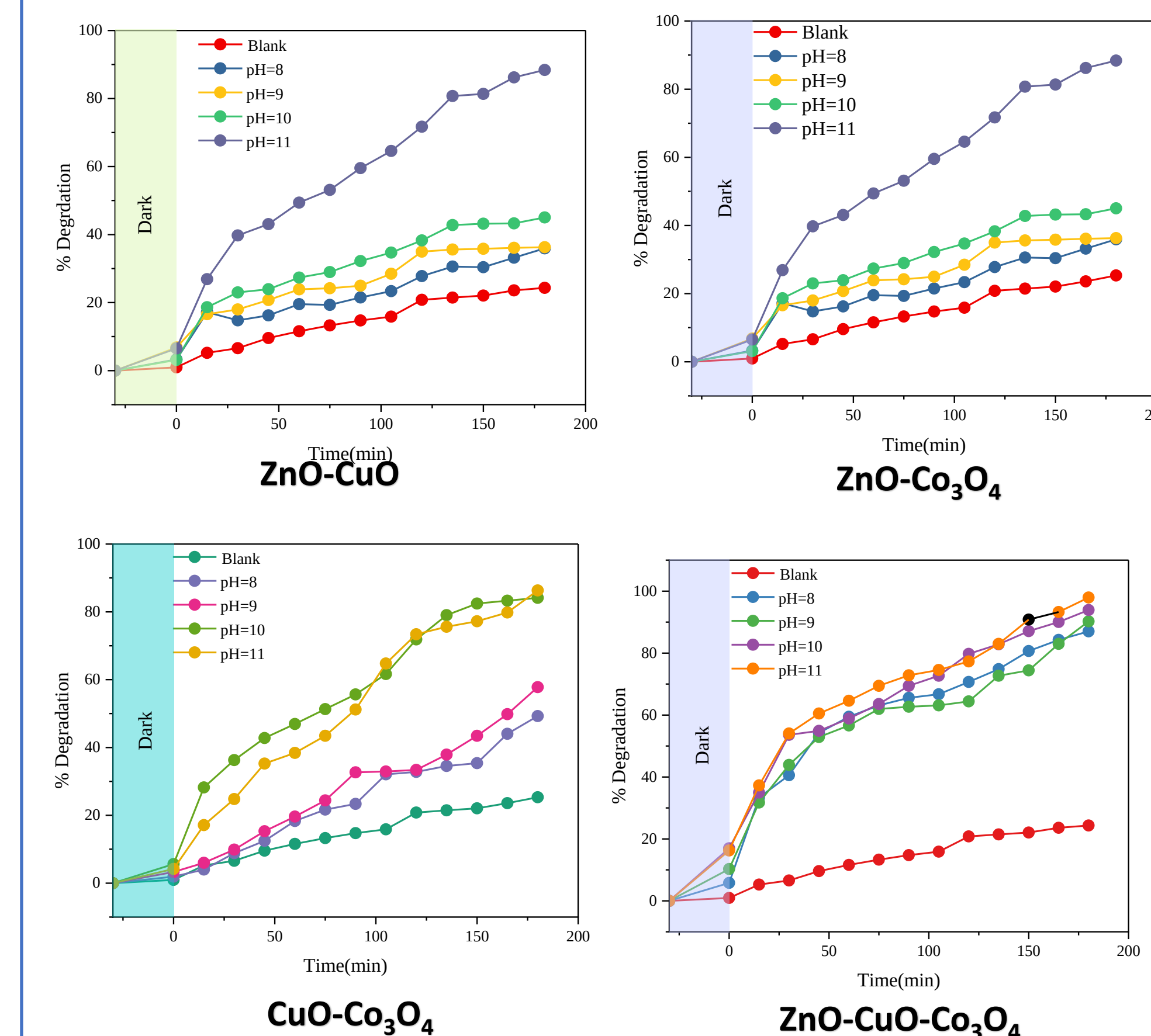
DYE DEGRADATION MECHANISM



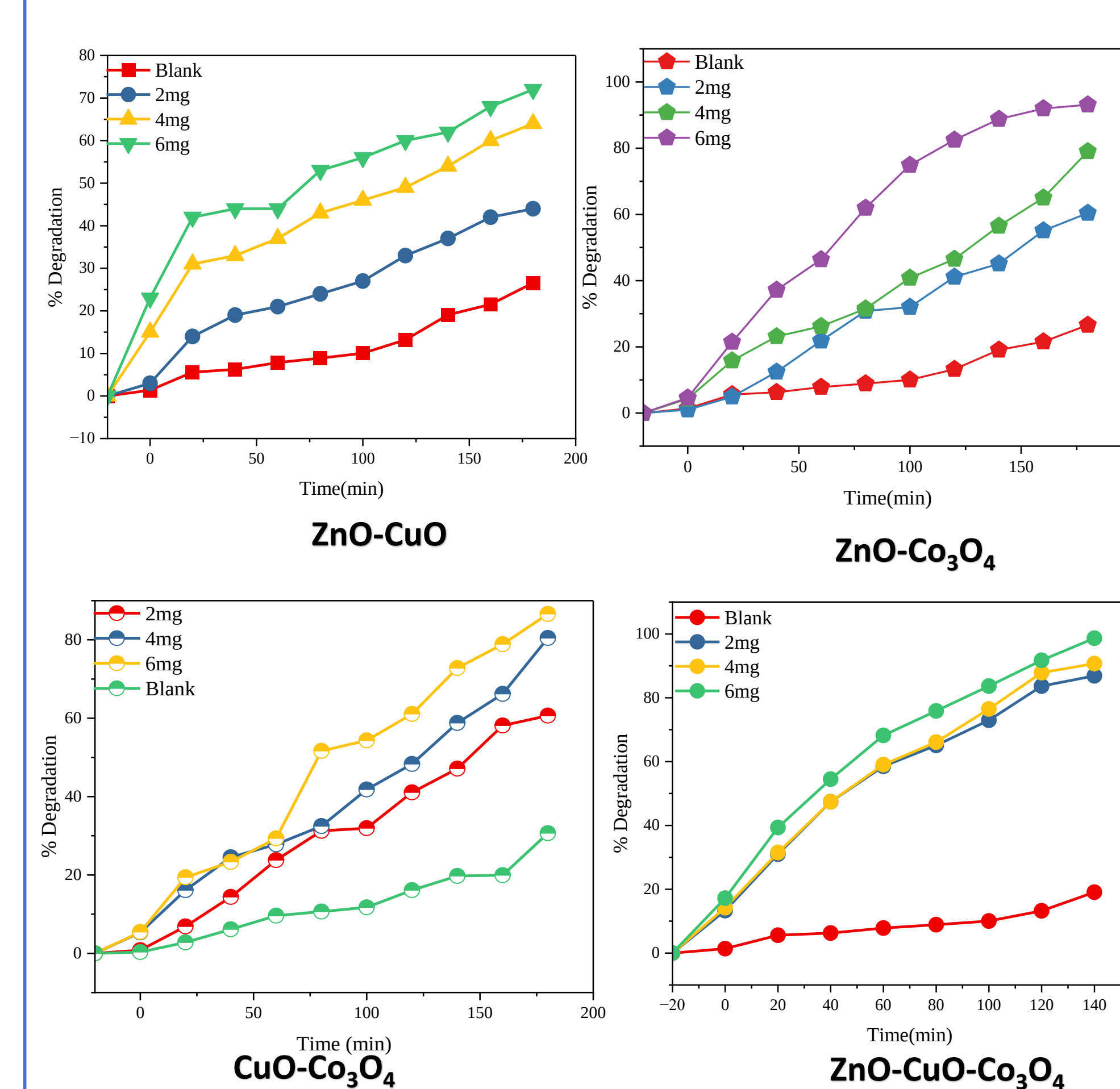
EFFECT OF IRRADIATION TIME ON DYE DEGRADATION



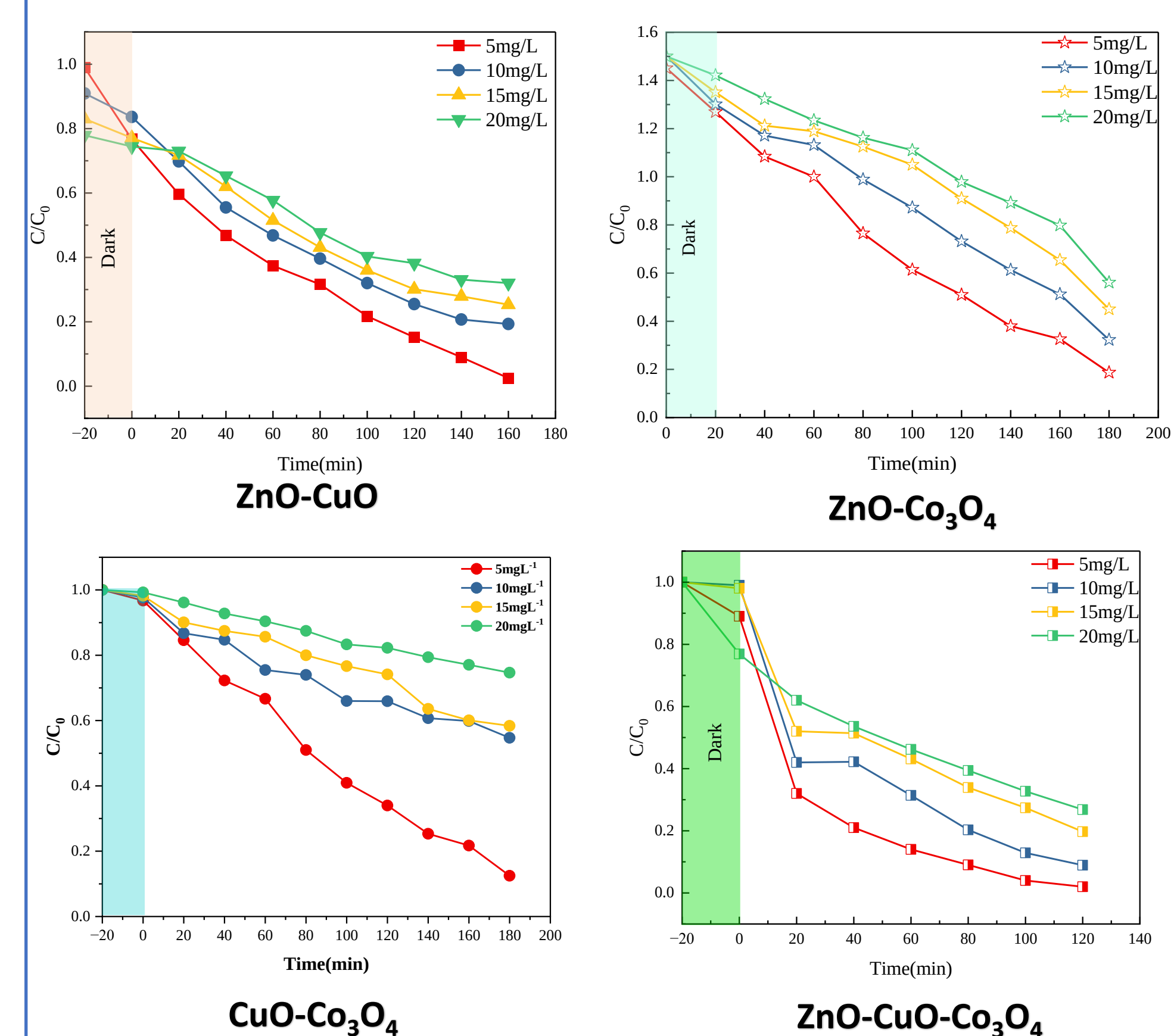
EFFECT OF pH



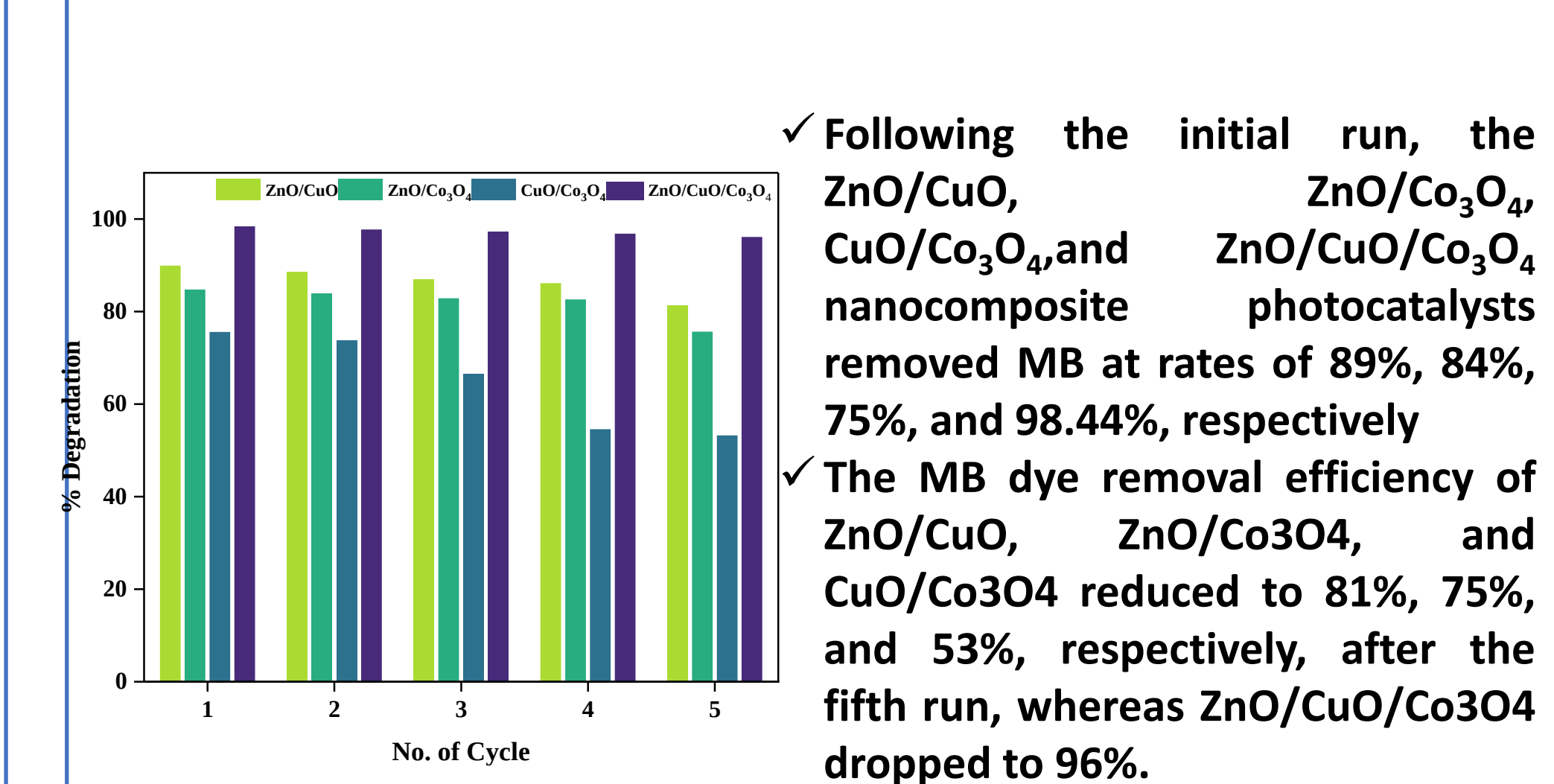
EFFECT OF CATALYST DOSAGE



EFFECT OF DYE CONCENTRATION



REUSABILITY



CONCLUSION

Dye, chemicals and auxiliaries from textile, paint and food processing industry

Severe environmental pollution

Aquatic toxic pollution

Threat to human and other living organism

Impact on biodiversity

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ACKNOWLEDGEMENT

Department of Chemistry, Comilla University