



Ce/Co Co-Doped Bi_2WO_6 for Efficient Solar-Driven Photocatalytic Degradation of Dye Pollutants: Structural, Optical and Dielectric Insights

Shoomaila Latif^a and Isra Tasawar^b

^aSchool of Chemistry, University of the Punjab, New Campus, 54590, Lahore, Pakistan

^bSchool of Physical Sciences, University of the Punjab, New Campus, 54590, Lahore, Pakistan



01. Introduction

- Dye-contaminated wastewater poses serious environmental and health challenges.
- Solar-driven photocatalysis offers a sustainable route for pollutant removal.
- Bi_2WO_6 is a visible-light-responsive Aurivillius oxide but suffers from charge-carrier recombination.
- Ce/Co co-doping can tailor electronic structure and improve photocatalytic efficiency.

02. Objective

To develop Ce/Co co-doped Bi_2WO_6 photocatalysts with enhanced structural, optical, dielectric, and photocatalytic properties for sustainable wastewater treatment.



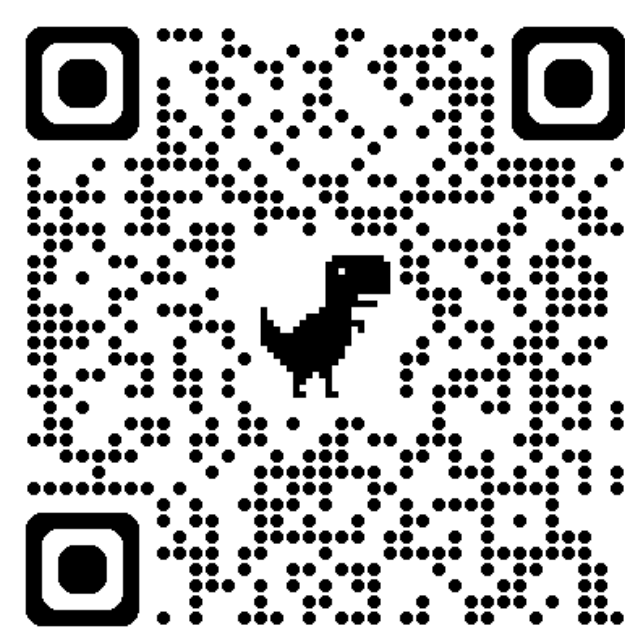
03. Methodology

Solid state reaction method



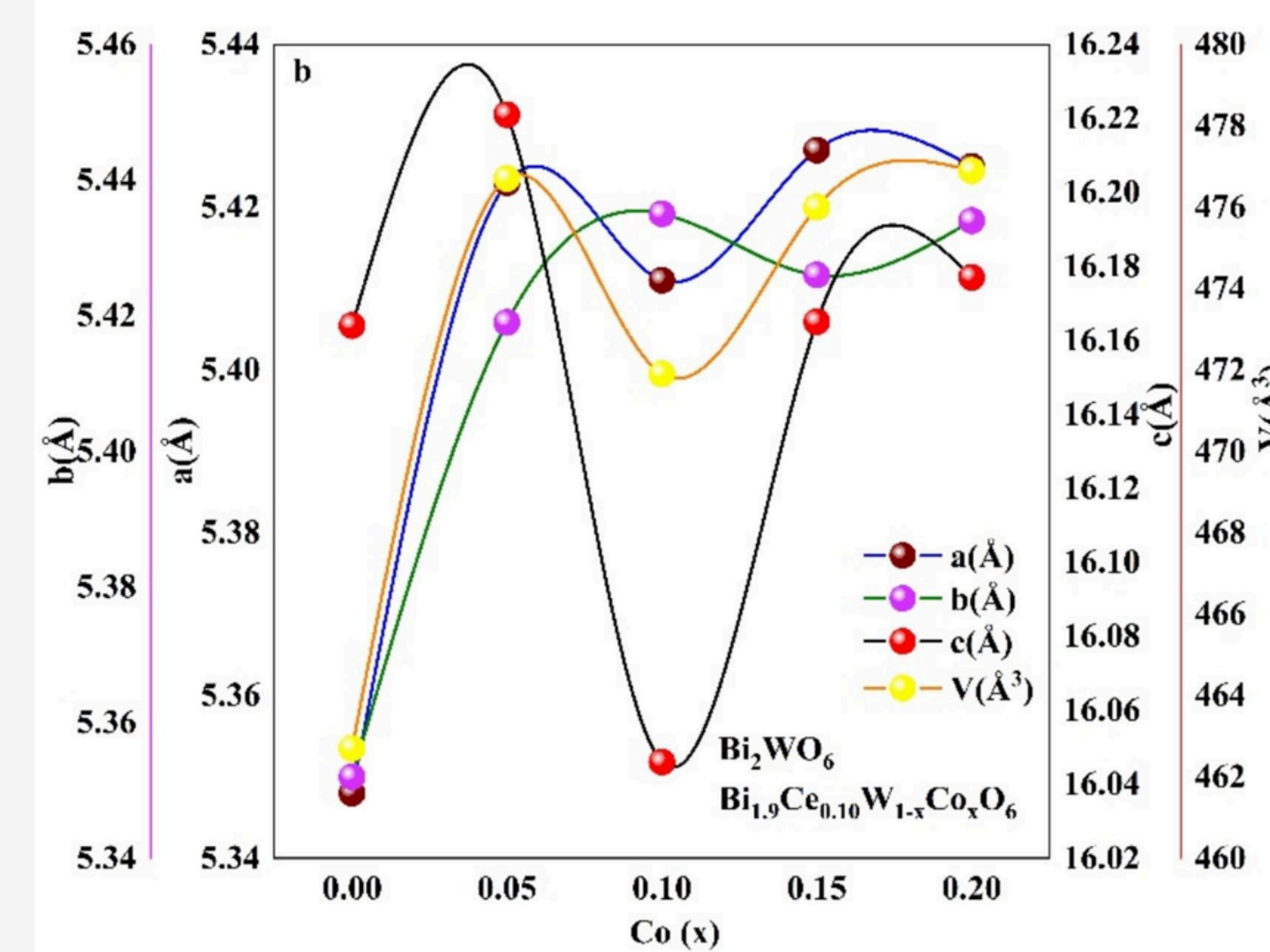
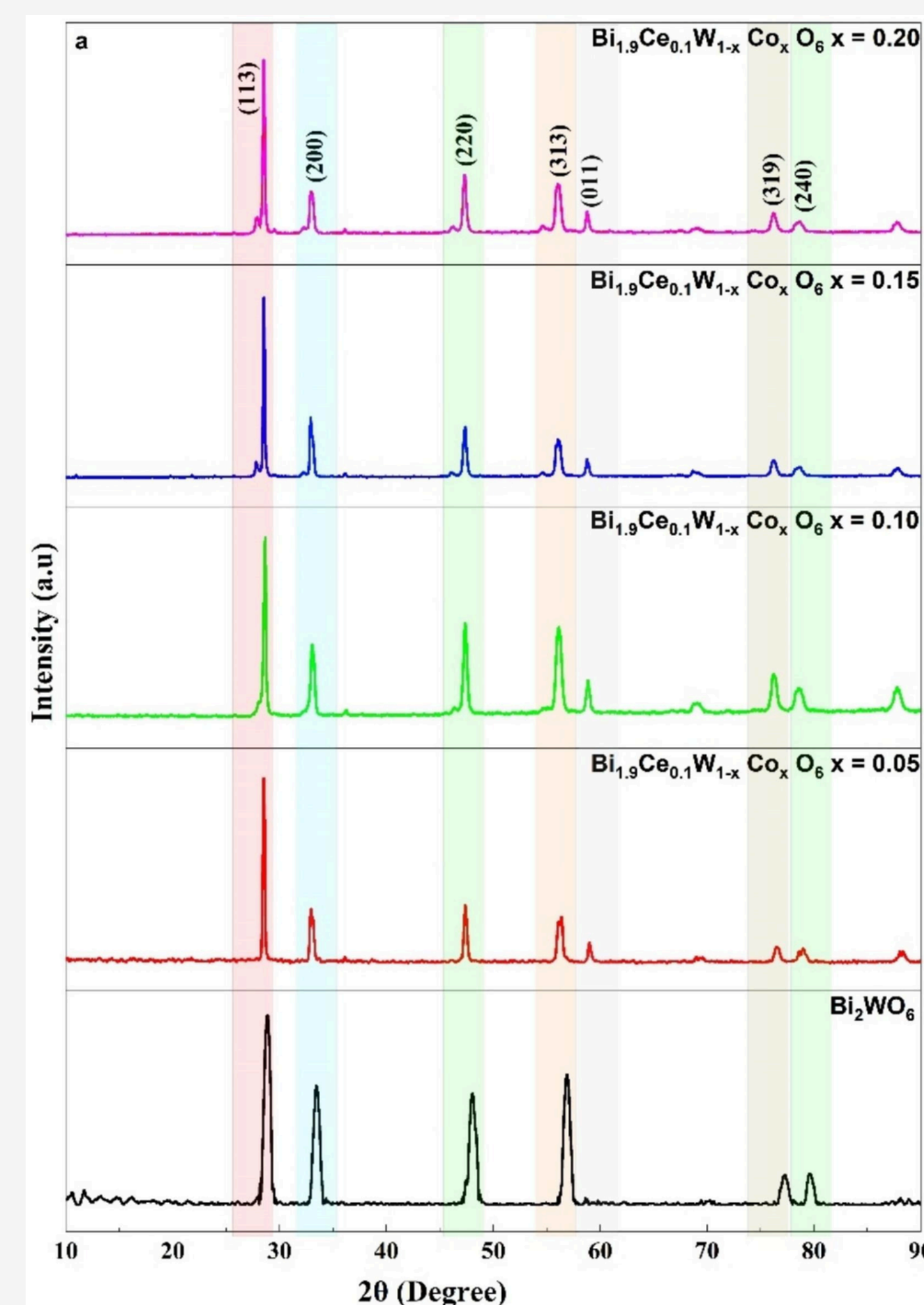
PUBLICATION & DATA AVAILABILITY

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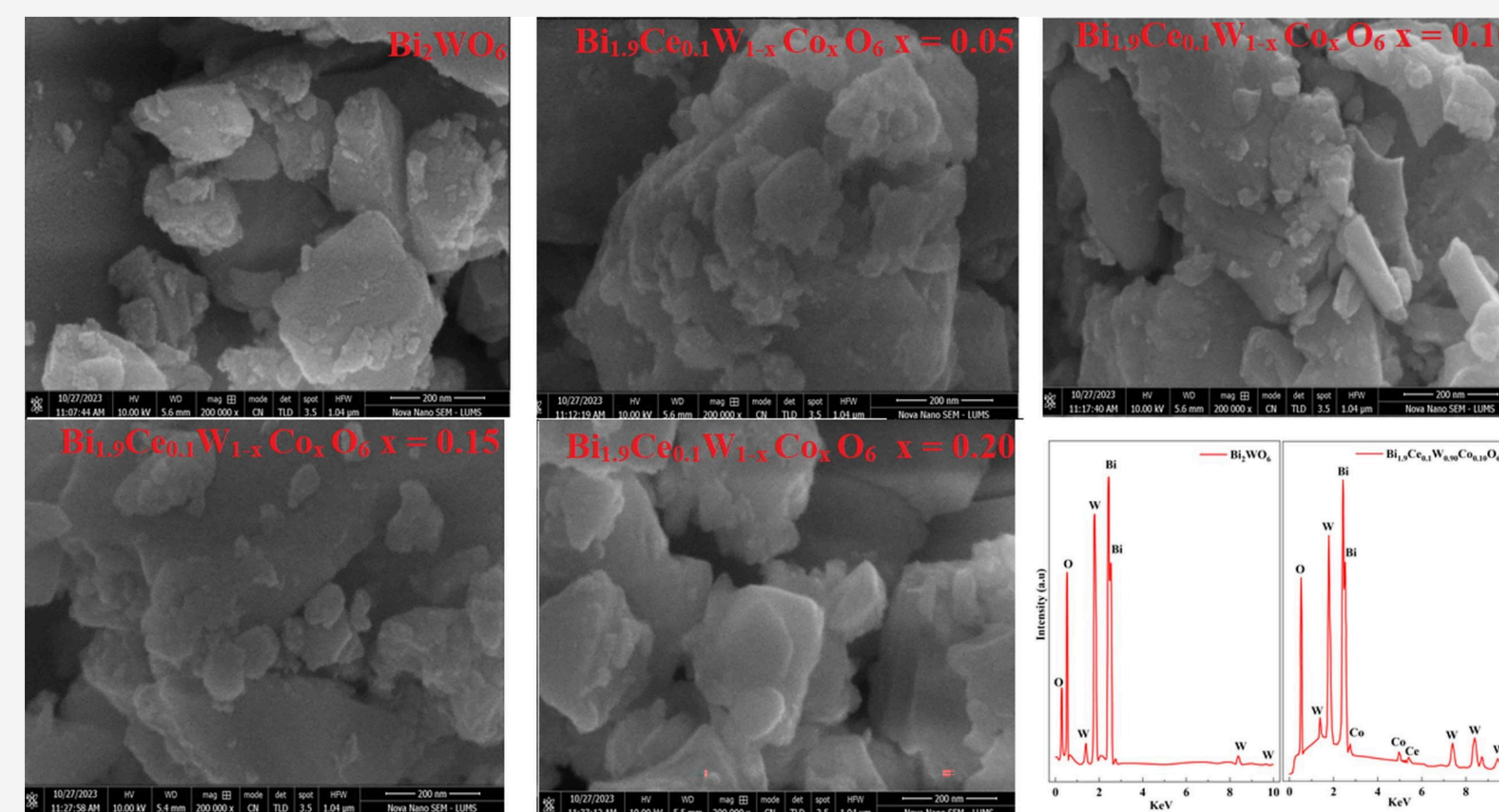
04. Analysis

• STRUCTURAL ANALYSIS



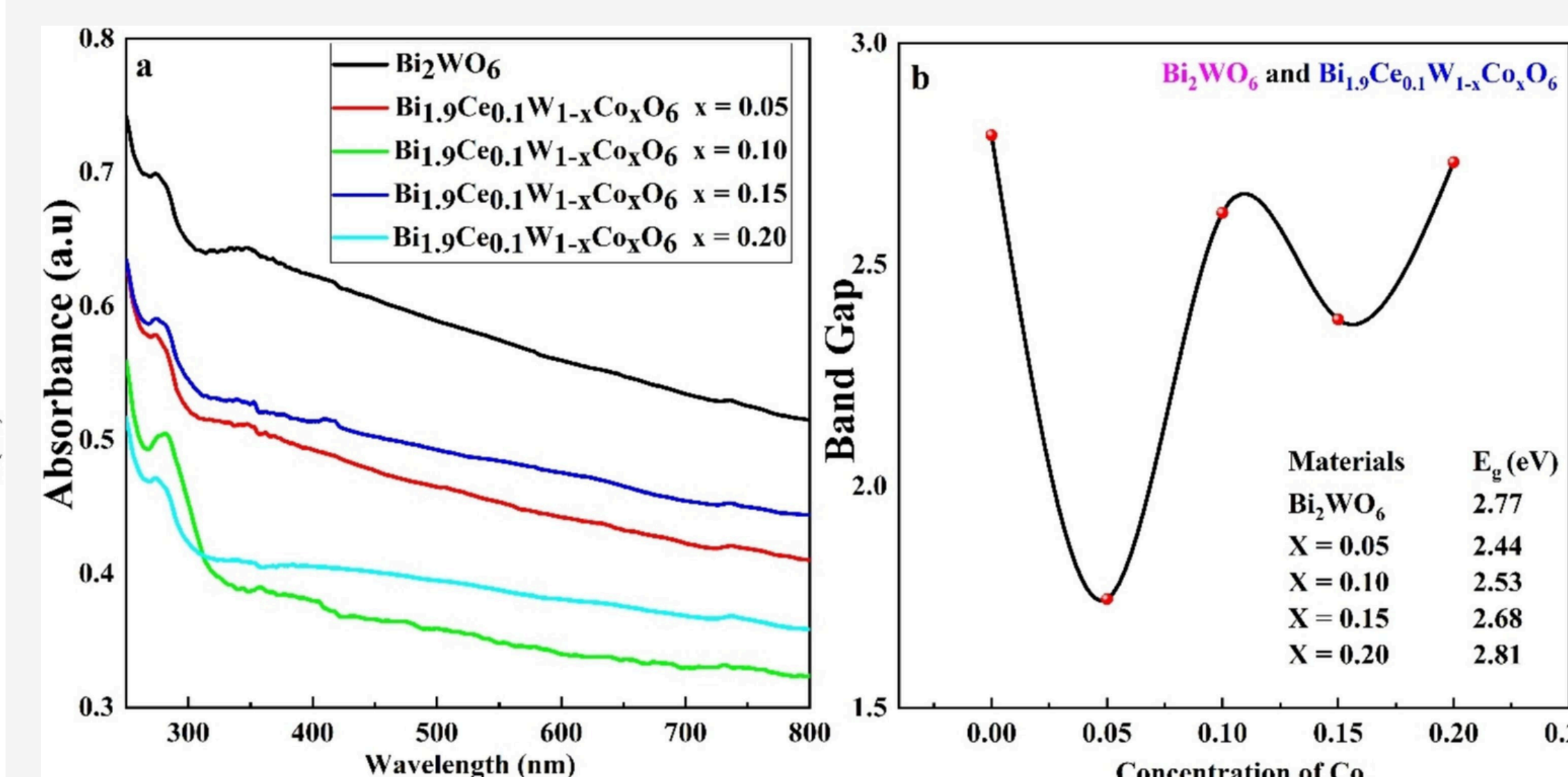
Single-phase orthorhombic Bi_2WO_6 retained after Ce/Co co-doping with no detectable impurity phases.

• MORPHOLOGICAL ANALYSIS



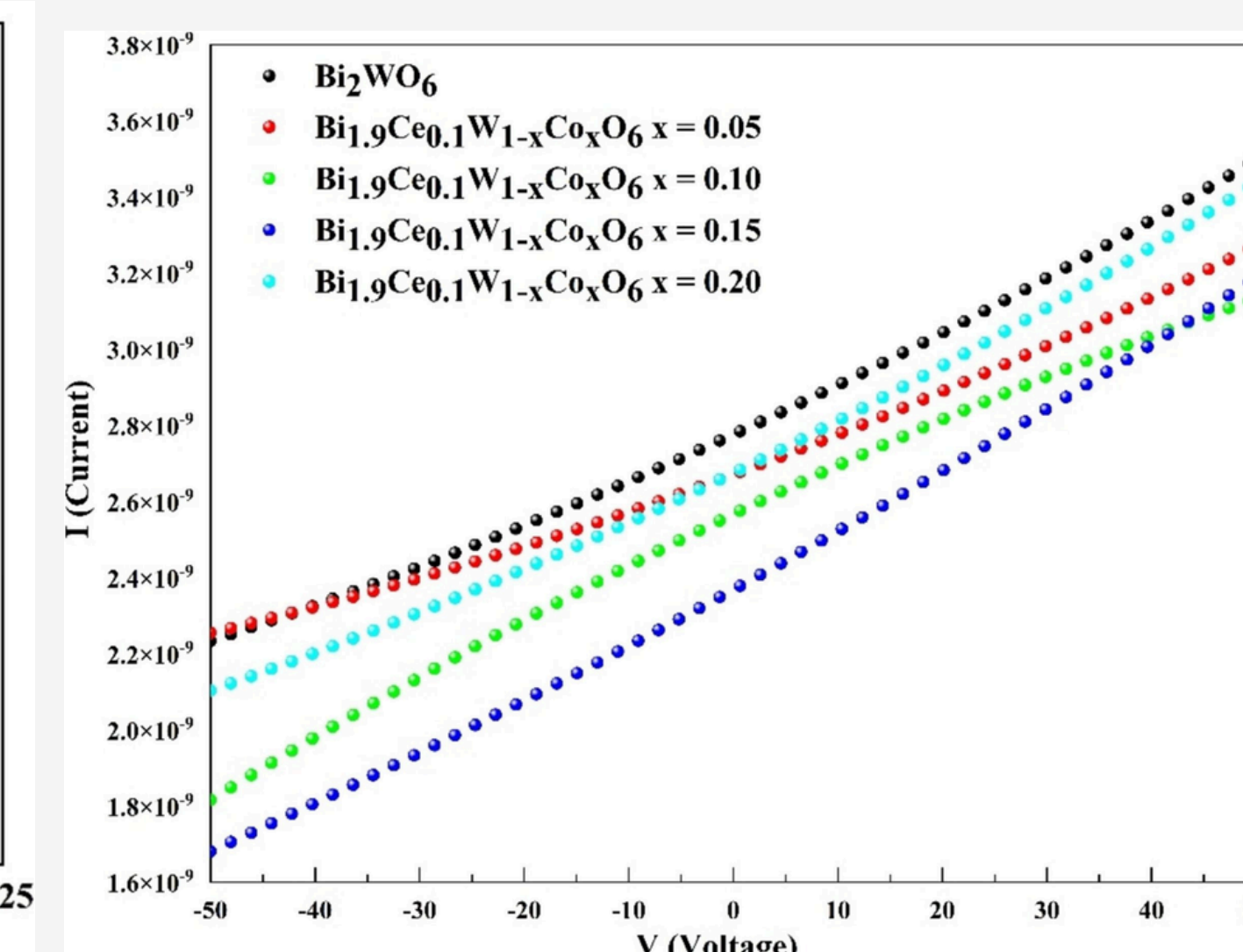
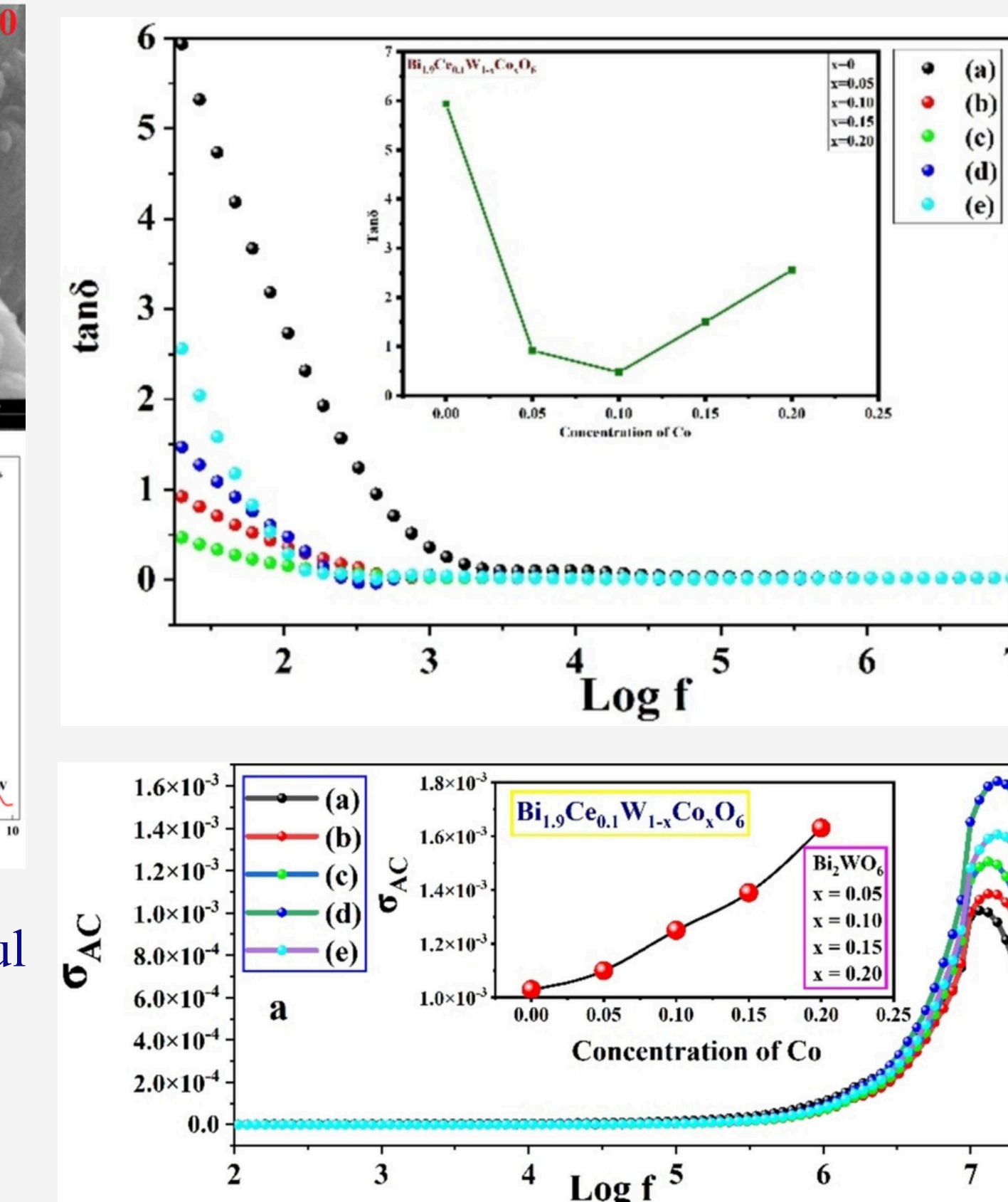
Co-doping modified particle morphology while EDX confirmed successful incorporation of constituent elements.

• OPTICAL PROPERTIES



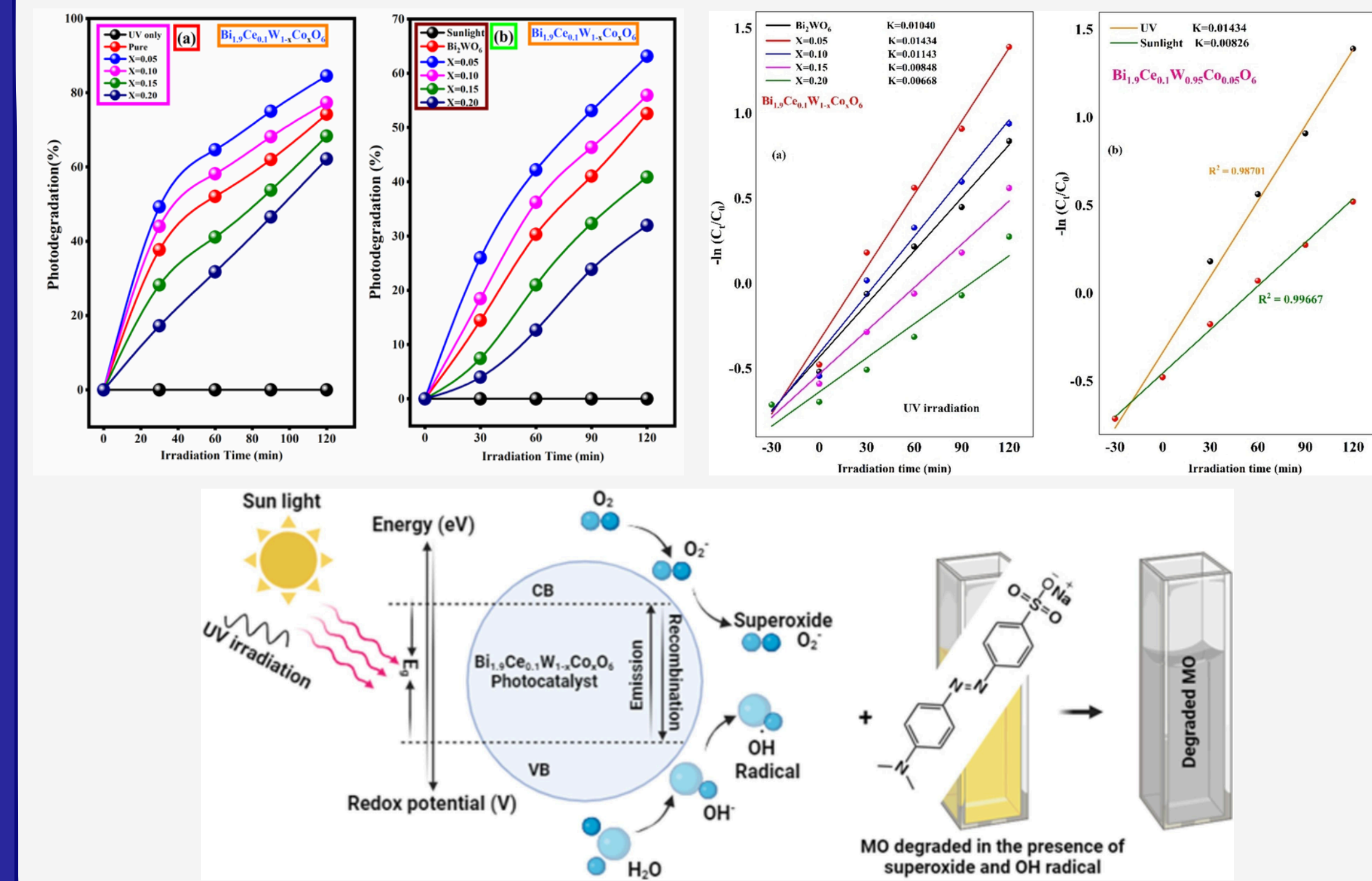
Band gap decreased from 2.77 eV to 2.44 eV, enhancing visible-light absorption.

• DIELECTRIC & ELECTRICAL PROPERTIES



Ce/Co co-doping reduced dielectric loss, increased AC conductivity, and improved charge transport characteristics.

05. PHOTOCATALYTIC PERFORMANCE



06. Results/Findings

- ✓ Single-phase orthorhombic structure
- ✓ Band gap reduced: 2.77 → 2.44 eV
- ✓ Lower dielectric loss
- ✓ Higher AC conductivity
- ✓ Improved charge separation
- ✓ 84.5% MO degradation (UV)
- ✓ 63.3% MO degradation (Sunlight)

BEST COMPOSITION
 $\text{Bi}_{1.9}\text{Ce}_{0.1}\text{W}_{0.95}\text{Co}_{0.05}\text{O}_6$

07. Conclusion

Ce/Co co-doping effectively enhanced the structural, optical, dielectric, and photocatalytic properties of Bi_2WO_6 . The optimized $\text{Bi}_{1.9}\text{Ce}_{0.1}\text{W}_{0.95}\text{Co}_{0.05}\text{O}_6$ composition demonstrated superior solar-driven dye degradation, highlighting its potential for sustainable environmental remediation and energy-related applications.