

# INVESTIGATION OF $\text{Cu}_x\text{Fe}_{2-x}\text{O}_3/\text{TiO}_2$ PHOTOCATALYST FOR WATER TREATMENT

Dmytro Danilian<sup>1</sup>, Arvo Kikas<sup>1</sup>, Angela Ivask<sup>2</sup>, Vambola Kisand<sup>1</sup>, Rainer Pärna<sup>1</sup>

<sup>1</sup>*Institute of Physics, University of Tartu, W.Ostwaldi 1, 50411 Tartu, Estonia*

<sup>2</sup>*Institute of Molecular and Cell Biology, University of Tartu, Riia 23, 51010 Tartu, Estonia*

e-mail of presenting author: [dmytro.danilian@ut.ee](mailto:dmytro.danilian@ut.ee)

Water purification is vital for providing safe and clean drinking water. Contamination by human activities and natural factors is a global concern. Photocatalysts can be used to degrade pollutants from drinking water sources with the help of light.  $\text{TiO}_2$  (P-25) is an effective photocatalyst under UV-A [1], however, its use is limited by recovery from water, which hinders its practical application in water treatment.

To address this limitation, our goal is to create material that has absorption under visible light, is magnetically recoverable and is photocatalytic. We synthesized  $\text{Cu}_x\text{Fe}_{2-x}\text{O}_3$  and mixed it with  $\text{TiO}_2$  (P-25) to create composite  $\text{Cu}_x\text{Fe}_{2-x}\text{O}_3/\text{TiO}_2$ . The  $\text{Cu}_x\text{Fe}_{2-x}\text{O}_3/\text{TiO}_2$  photocatalyst had particle sizes between 500 and 5000 nm. The  $\text{Cu}_x\text{Fe}_{2-x}\text{O}_3/\text{TiO}_2$  material showed a significant absorbance under visible light. The Near Edge X-ray Absorption Fine Structure Spectroscopy measurements carried out at the FinEstBeaMS beamline (MAX IV laboratory, Lund, Sweden) demonstrated that the  $\text{Cu}_x\text{Fe}_{2-x}\text{O}_3$  had hematite or magnetite structure, Cu was in  $1^{+}/2^{+}$ , and Fe was mainly in  $3^{+}$  oxidation states. When  $\text{Cu}_x\text{Fe}_{2-x}\text{O}_3$  content was 10%, it was magnetically recoverable. The composite  $\text{Cu}_x\text{Fe}_{2-x}\text{O}_3/\text{TiO}_2$  showed photocatalytic activity.

Our preliminary results demonstrate that composite  $\text{Cu}_x\text{Fe}_{2-x}\text{O}_3/\text{TiO}_2$  has the potential for photocatalytic water treatment.

## References

1. Cheeseman, S. et al. *Advanced Science* 7, (2020), 1902913.



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