

**Green Synthesis of TiO<sub>2</sub> using *Impatiens rothii* Hook.f. leaf extract for efficient removal of methylene blue dye**

**Getye Behailu Yitagesu<sup>a</sup>, Dereje Tsegaye Leku<sup>a\*</sup>, Getachew Adam Workneh<sup>b,c\*</sup>**

<sup>a</sup> Department of Applied Chemistry, School of Applied and Natural Sciences, Adama Science and Technology University, P.O. Box 1888, Adama, Ethiopia,

<sup>b</sup> Department of Industrial Chemistry, Addis Ababa Science and Technology University, P.O. Box 16417, Addis Ababa, Ethiopia, <sup>c</sup> Sustainable Energy Center of Excellence, Addis Ababa Science and Technology University, P.O. Box 16417, Addis Ababa, Ethiopia

**\*Corresponding Authors:** detsegaye@gmail.com, getachew.adam@aastu.edu.et

### PZC via salt addition method

The point of zero charge was determined using salt addition method <sup>1</sup>. An amount of 50 mL of 0.01 M aqueous solution of  $\text{KNO}_3$  was added into each of ten Erlenmeyer flasks. Then 10 mg of  $\text{TiO}_2$  was added to each solution and the initial pH was adjusted to 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 using 0.1M NaOH and 0.1 M HCl.

At  $\text{pH}_{\text{ZPC}} = 7.32$ , the surface of the adsorbent (IL- $\text{TiO}_2$ ) is neutral so neither cation nor anion is attracted to the surface. Below PZC the surface of adsorbent is positive and attract anions, whereas above PZC the adsorbent's surface becomes negatively charge so it may attract cationic species. Aqueous solution of methylene blue dye, dominantly cationic, is attracted to the surface of IL- $\text{TiO}_2$  nanoparticles at the solution  $\text{pH} > \text{pH}_{\text{ZPC}}$ .

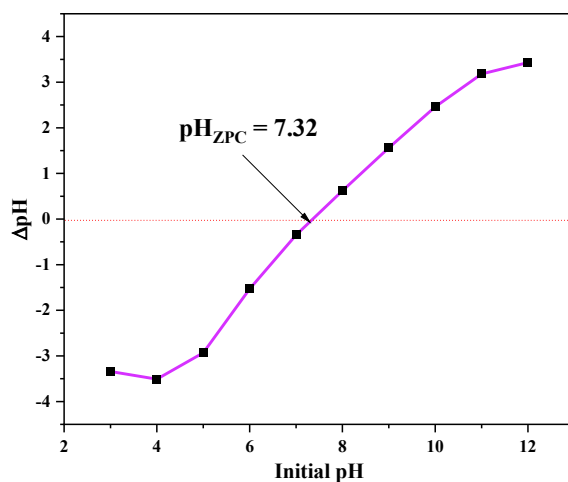


Figure S1. Zero point charge determination of IL- $\text{TiO}_2$ .

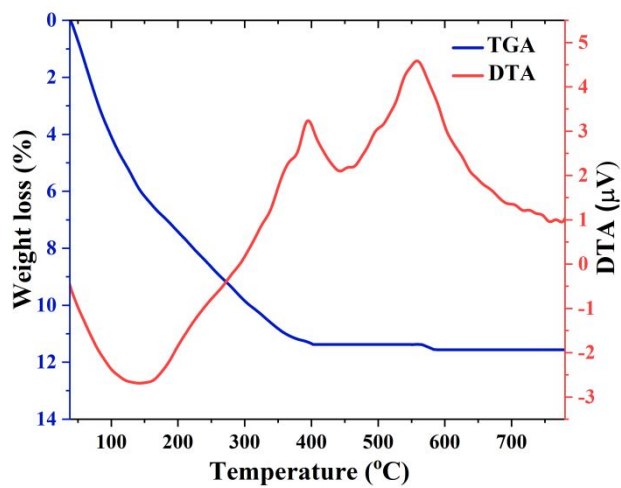


Figure S2. Thermal stability measurement of IL-TiO<sub>2</sub> before calcination.

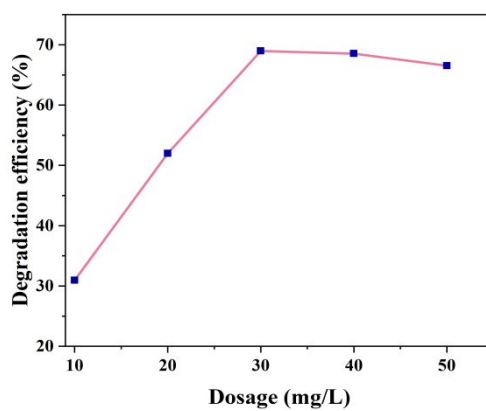


Figure S3. Photodegradation efficiency of IL-TiO<sub>2</sub> at different catalyst dose.

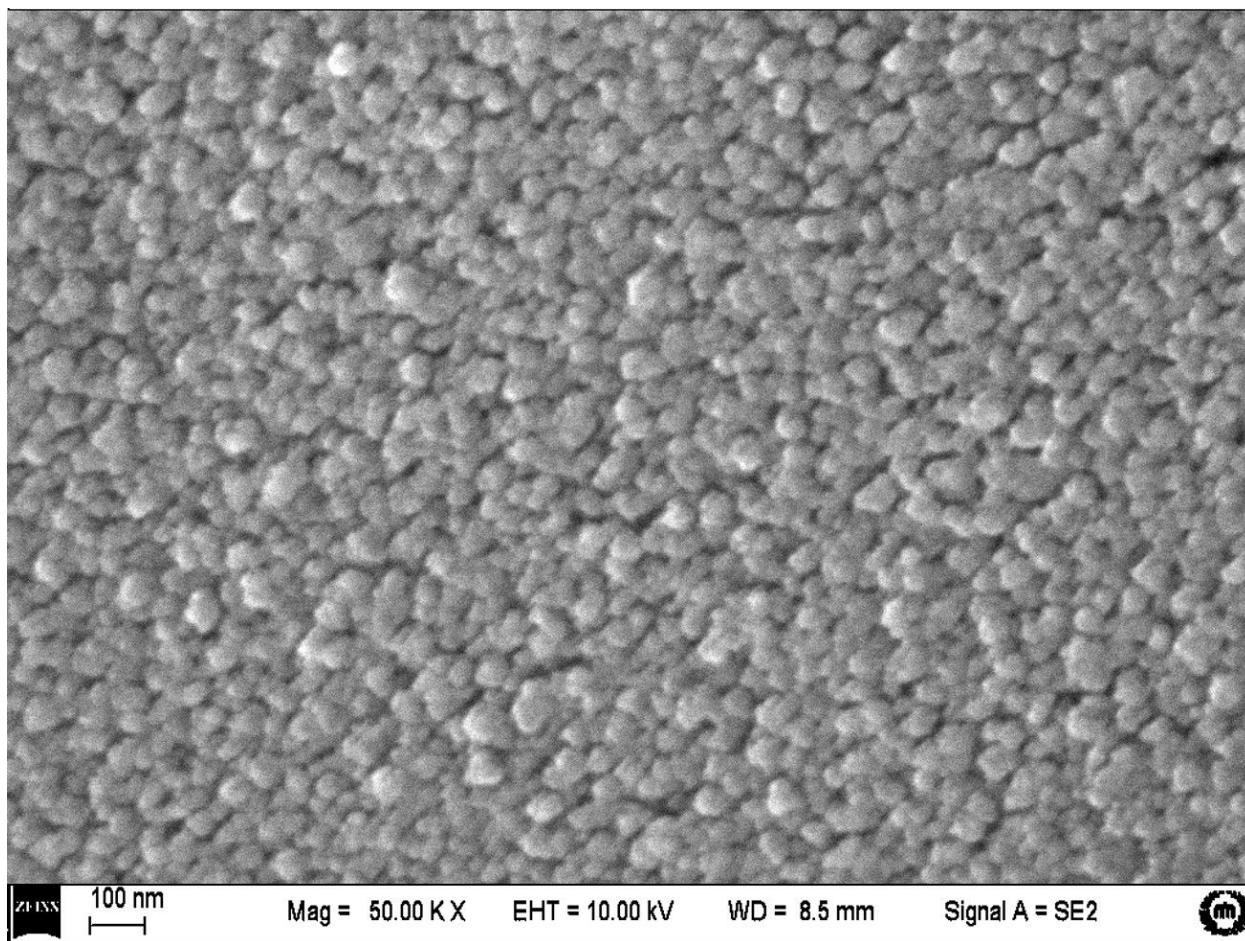


Figure S4. SEM micrograph of IL-TiO<sub>2</sub>.

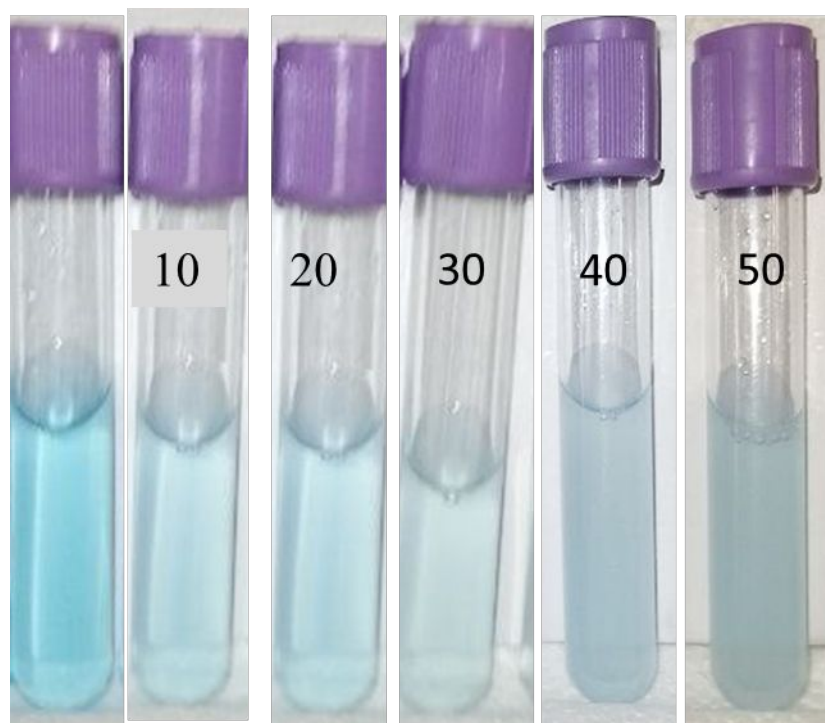


Figure S5. Photos of 10 ppm methylene blue solution before irradiation and after 60 minutes of irradiation of 10 mg, 20 mg, 30 mg, 40 mg and 50 mg of IL-TiO<sub>2</sub>.

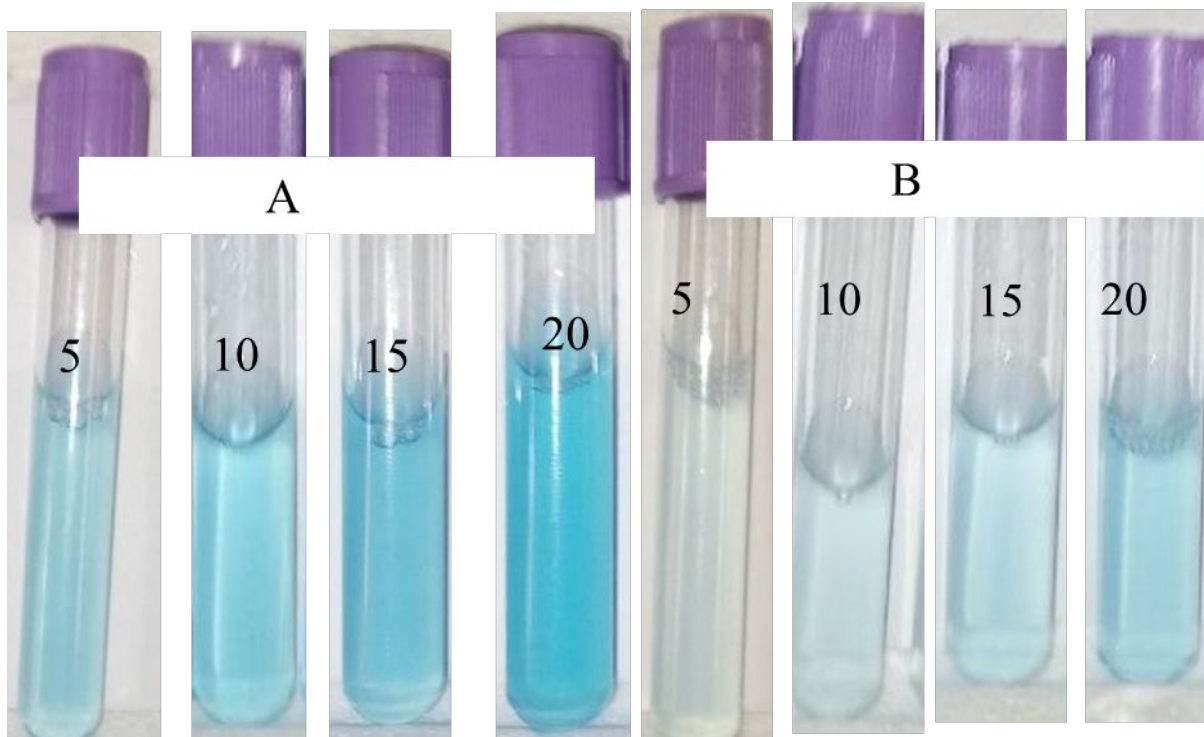


Figure S6. Photos of 5, 10, 15 and 20 ppm of methylene blue (A) before irradiation and (B) after 60 minutes of irradiation.

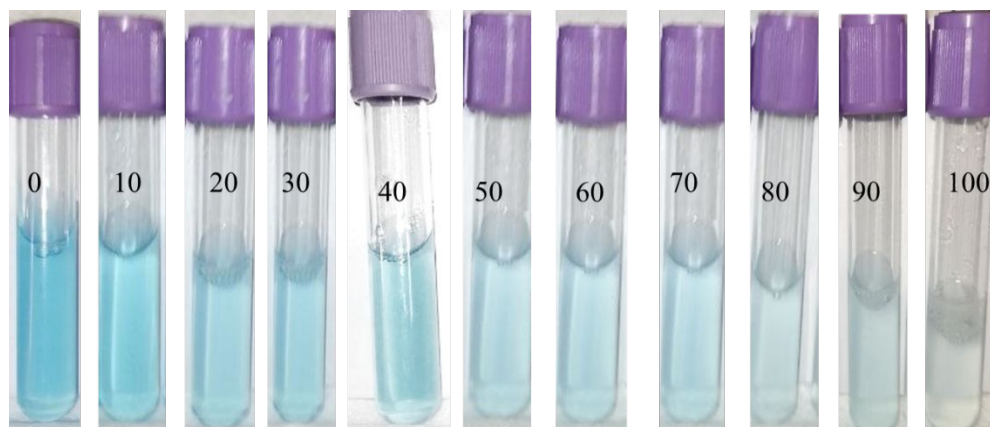


Figure S7. Photos of methylene blue from 0-100 minutes of irradiation in the presence of IL-TiO<sub>2</sub> photocatalyst.

### **Phytochemical Analysis**

The aqueous extract and ethanol extract were used to phytochemical tests to identify chemical composition of the *Impatiens rothii* Hook.f. leaf. Table S1 presents the phytochemical screening tests.<sup>2-5</sup>

#### **Test for Alkaloid**

An amount of 2 mL of the IL extract was treated with a few drops of Wagner reagent, and the formation of yellowish color is an indication of the presence of alkaloid.

#### **Test for Flavonoid**

In a 2 mL concentrated extract 1 mL of 10% NaOH solution was added and the formation of the intense yellow color indicates the presence of flavonoids

#### **Test for proteins**

In a dry test tube 2 mL extract was taken and then HNO<sub>3</sub> solution was added drop wisely. The formation of yellow color shows the presence of proteins.

#### **Test for Phenol**

About 2 mL of the plant extract was taken into a test tube, and 3 drops of 3% of FeCl<sub>3</sub> was added. The formation of dark green color confirms the presence of phenolic compounds.

### **Test for Saponnins**

Plant extract (2mL) was treated with few drops of 1% lead acetate solution. The Formation of white precipitates indicates the presence of Saponnins.

### **Test for Steroids**

About 2 mL of extract was taken into a test tube and 1mL of chloroform was poured to the test tube. An amount of 2 mL of acetic anhydride and 0.5 mL of concentrated sulfuric acid were added to the test tube drop wisely. The solution was shaken slowly and the formation of red color in the upper layer of the test tube indicating the presence of steroids.

### **Test for Tannins**

An amount 3 ml of an aqueous solution of plant extract was taken into a test tube followed by addition of 4 drops of 1% lead acetate solution. The formation of yellowish precipitate is an indication for the presence of tannins.

### **Test for Terpenoids**

Two milliliters of plant extract was taken into a test tube and 1mL of chloroform was added. Then 1 mL of concentrated sulfuric acid was added drop wisely to the test tube and shaken slightly. The formation of yellow color in lower portion indicates the presence of terpenoids.

Phytochemicals	Aqueous extract	Ethanol extract
Alkaloids	+	++
Flavonoids	+++	++
Proteins	++	+++
Phenols	++	++
Saponnins	+	++
Steroids	+	++
tannins	-	-
Terpenoids	+	-

‘-’ absence, ‘+’ slightly present, ‘++’ moderately present, ‘+++’ intensively presence  
(based on intensity of observed color).

## References

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