

Área: FIS

## Synthesis and application of TiO<sub>2</sub>NT/AgNP heterojunctions for photoelectrochemical detection of Clonazepam

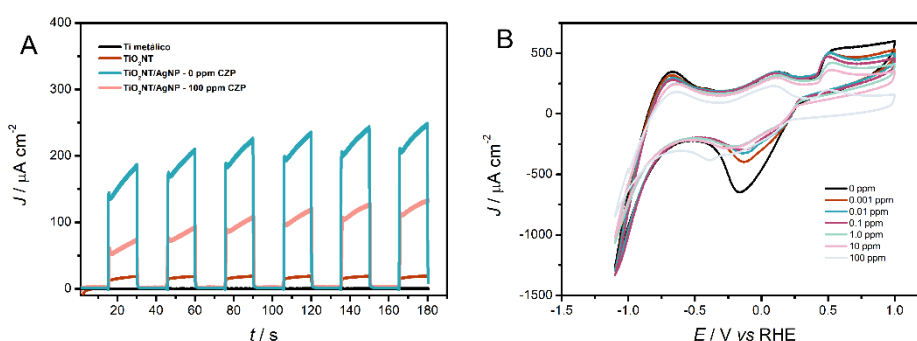
Samantha Torres Ohse (PG)<sup>1</sup>, Mauro Chierici Lopes (PQ)<sup>1</sup>, Mariana de Souza Sikora (PQ)<sup>1,2</sup>[samanthatohse@gmail.com](mailto:samanthatohse@gmail.com)<sup>1</sup>Departamento de Química, Universidade Estadual do Centro Oeste (UNICENTRO) – Campus CEDETEG; <sup>2</sup>Departamento de Química, Universidade Tecnológica Federal do Paraná (UTFPR) – Campus Pato Branco.Keywords: TiO<sub>2</sub>NT, Silver Nanoparticles, Clonazepam, Photoelectrochemical Detection, Photocurrent.

### Highlights

Synthesis of a new material based on heterojunctions of TiO<sub>2</sub>NT with silver nanoparticles AgNP incorporation to TiO<sub>2</sub>NT lead to increase in resultant photocurrent density  
TiO<sub>2</sub>NT/AgNP films demonstrated potential for indirect photoelectrochemical detection of Clonazepam

### Abstract

Nanotubular titanium dioxide (TiO<sub>2</sub>NT) is a promising semiconductor for photoelectrochemical detection due to its stability and biocompatibility. However, its efficiency is limited by low visible light absorption, a characteristic of n-type semiconductors<sup>[1,2]</sup>. To overcome this, this work synthesized a novel material, formed by TiO<sub>2</sub>NT and silver nanoparticles (AgNP) heterojunctions. The TiO<sub>2</sub>NT/AgNP composite exhibited enhanced photocatalytic performance, with a significant increase in light absorption and photocurrent density under irradiation. The material also proved sensitive for the detection of the drug Clonazepam (CZP) in the range of 0.001–100 ppm, where the photocurrent decreased gradually with increasing analyte concentration. These results indicate that the developed platform has potential application for the environmental monitoring of this emerging contaminant.



**Figure 1.** A) Resultant photocurrent density for different TiO<sub>2</sub> films. B) Cyclic Voltammograms for TiO<sub>2</sub>NT/AgNP film in the concentration range of 0.00 – 100.00 ppm. Support electrolyte: Tris-HCl 0.1 M and pH = 8,00. Scan rate = 100 mV s<sup>-1</sup>. Source: Author (2025).

[1] HASANI, S.; ARVAND, M.; HABIBI, M. F. *Microchemical Journal*, v. 185, 2023.

[2] ZHANG, L.; JARONIEC, M. *Applied Surface Science*, v. 430, 2018.

### Acknowledgments

The authors are grateful to CAPES, CNPq, and UNICENTRO.