

**Name:**

Juan Camilo Murillo-Sierra

**Research Group (if relevant):**

Laboratory of Photocatalysis and Environmental Electrochemistry

**Research Centre (if relevant):****Department/School(s) (if relevant):**

Faculty of Chemical Sciences

**College:**

Universidad Autónoma de Nuevo León

**Supervisor(s):**

Dr. Aracely Hernández Ramírez

**Funding body:**

National Council of Sciences and Technology (CONACYT)

**Area (field) of study:**

Heterogeneous photocatalysis for CO<sub>2</sub> conversion in valuable compounds

**Thesis Title:**

“Photocatalytic reduction of CO<sub>2</sub> using the heterostructured catalyst ZnS/WO<sub>3</sub> under UV-Vis light irradiation”

**Abstract:**

Nowadays is a great challenge the efficient production of renewable fuels to mitigate the imminent shortage of fossil fuels in the future. Therefore, it is necessary to focus the efforts on the fight against greenhouse gases accumulation, mainly due to CO<sub>2</sub> emissions. For these reasons, in this

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study the main objective is to synthesize the heterostructured catalyst ZnS/WO<sub>3</sub> to carry out the CO<sub>2</sub> reduction in a continuous photoreactor by heterogeneous photocatalysis in order to produce valuable compounds such as CO, CH<sub>4</sub> and CH<sub>3</sub>OH. Additionally the possible charge transfer mechanism in the semiconductor interface and the chemical reaction mechanism involved in this process will be investigated.

### Collaborations:

- Dr. Enric Brillas Cosso – Laboratori d'Electroquímica dels Materials i del Medi Ambient, Universitat de Barcelona
- Dr. Ignasi Sirés – Laboratori d'Electroquímica dels Materials i del Medi Ambient, Universitat de Barcelona
- Dr. Fiderman Machuca Martínez – Grupo de investigación GAOX, Universidad del Valle

### Publications:

- Murillo-Sierra, J. C., Ruiz-Ruiz, E., Hinojosa-Reyes, L., Guzmán-Mar, J. L., Machuca-Martínez, F., & Hernández-Ramírez, A. (2017). Sulfamethoxazole mineralization by solar photo electro-Fenton process in a pilot plant. *Catalysis Today*, (November), 1–7. <https://doi.org/10.1016/j.cattod.2017.11.003>
- Murillo-Sierra, J. C., Sirés, I., Brillas, E., Ruiz-Ruiz, E. J., & Hernández-Ramírez, A. (2017). Advanced oxidation of real sulfamethoxazole + trimethoprim formulations using different anodes and electrolytes. *Chemosphere*, 192, 225–233. <https://doi.org/10.1016/j.chemosphere.2017.10.136>

### Presentations:

- **J.C. Murillo**, A. Hernández Ramírez \*, E.J. Ruiz Ruiz, L. Hinojosa-Reyes, J.L. Guzmán-Mar, M. Villanueva Rodríguez. Degradación de sulfametoxazol en medio acuoso por foto electro-Fenton solar usando cátodo de difusión de aire en planta piloto. XXXII Congreso Nacional de la Sociedad Mexicana de Electroquímica, Guanajuato, México. Junio 5 al 8 de 2017. Presentation: Poster.
- **J. Murillo-Sierra**, A. Hernández-Ramírez, E. Ruiz-Ruiz, L. Hinojosa-Reyes, J.L. Guzmán-Mar, F. Machuca-Martínez. Sulfamethoxazole mineralization by solar photo electro-Fenton process in a pilot plant. 5<sup>th</sup> European Conference on Environmental Applications of Advanced Oxidation Processes (EAAOP5), Praga, República Checa. June 25 – 29<sup>th</sup> of 2017. Presentation: Poster, and short communication.