# Solar energy conversion: photocatalysts for application in photo-electrochemical oxidation of antibiotics and for $CO_2$ reduction

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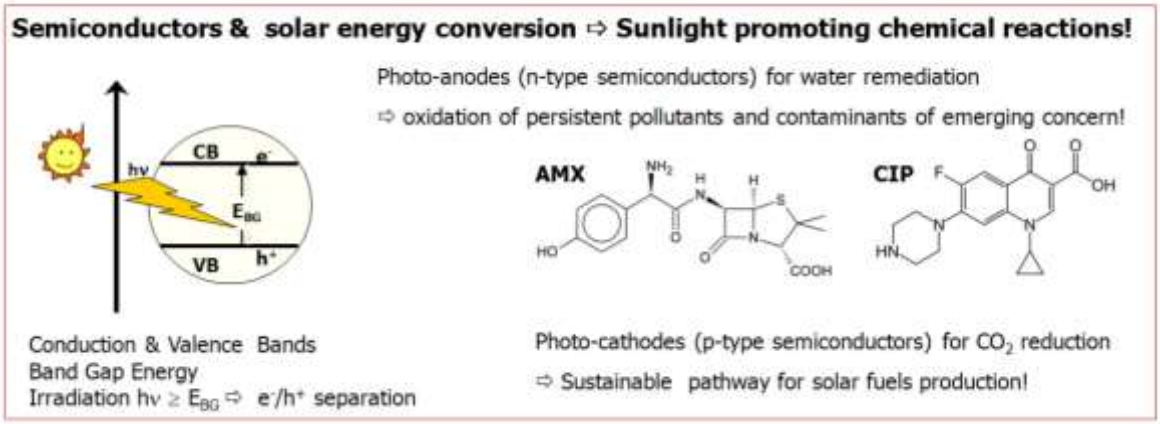
Semiconductor electrodes have been investigated to convert solar energy for use in different applications of technological interest, such as water remediation [1] and solar fuels production.[2]

Films of $TiO_2$ and $WO_3/TiO_2$ deposited on stainless steel (SS) or glass covered with F-doped $SnO_2$ (FTO), irradiated by a solar simulator, were used for oxidation of ciprofloxacin (CIP) and amoxicillin (AMX) antibiotics in aqueous solutions by heterogeneous photocatalysis (HP). After inclusion of a Pt counter-electrode, application of an external bias or connection of the electrodes with a solar cell, which resulted in an electrochemically assisted HP (EHP) configuration, enhanced in 30 % the efficiency for photocatalytic removal of these antibiotics from aqueous solution. Thus, these n-type semiconductor electrodes in EHP configuration can be considered a promising alternative for removal of persistent pollutants and contaminants of emerging concern from aqueous environments.

We have also been investigating photocatalysts for reducing $CO_2$ to syngas, hydrocarbons and other value-added chemicals. Porous thin films electrodes of silver-bismuth or copper tungstates, which exhibited p-type behaviour, were used as photo-cathodes for $CO_2$ reduction reaction ($CO_2$RR). During electrolysis performed under solar simulated irradiation at -0.4 V (vs Ag/AgCl) in $CO_2$ saturated $NaHCO_3$ aqueous solutions, HCOOH was identified and GC analysis revealed that the amount of produced CO increased with irradiation time. Also, since these photo-cathodes exhibited stable performance for long-term electrolysis, the complex oxides of Ag-Bi-W and Cu-W systems can be considered suitable photocatalysts for $CO_2$RR in a sustainable pathway for solar fuels production. **Acknowledgements:** "CINE-Center for Innovation on New Energies", Fapesp, Shell, ANP, Capes, CNPq and Faepex-Funcamp.

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