

Biosolar-Detox: Disinfection and elimination of pollutants with solar light

<http://biosolar.univalle.edu.co>

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The Biosolar-detox project was carried out between an EPFL laboratory and several groups from Universidad del Valle (INIVALLE), Cali, Colombia between 2005-2008. The main objective was the development of solar-based processes for the elimination of organic pollutants in industrial wastewaters and the disinfection of drinking water sources. Inexpensive TiO₂ and Fe salts were introduced in water and exposed to solar light to generate very reactive and short-lived oxidative species that attack organic pollutants and inactivate bacteria.

The scientific information gained during the two first years of intensive research at laboratory level allowed the building and operation of solar photo-reactors subsequently used for dyes and agro-industrial wastewater treatment and reuse. The developed helio-catalytic system was erected in a paper flexographic company (CARVAJAL) to reduce the color of wastewater allowing its reuse in the industrial process. A patent has been deposited by UNIVALLE for the latter system. Moreover, a solar photo-reactor, coupled with a bio-reactor, was built in a sugar cane plantation for the treatment of agro-industrial wastewater contaminated with pesticides.

The developed helio-catalytic system, in presence of very low quantities of iron salts, also exhibits a very good efficiency in killing pathogenic microorganisms from different water sources. In addition to bacterial disinfection, bacteriophage ΦX174 and a wide range of organic substances are removed from drinking water sources. This process, coupled with a conventional filtration pretreatment, is expecting financial support allowing its evaluation and transfer to population. This technology could produce 50 to 100 liters of safe water per m³ of solar reactor and per day for small communities living in the sunny areas of the planet.

Biosolar-Detox involved 5 Ph.D., 8 Master, 30 undergraduate students from UNIVALLE and 4 EPFL trainees. The most outstanding scientific results have lead to 15 papers in referenced international scientific journals, 7 in national journals and books, 24 presentations in international workshops and 3 in national meetings. The project was the initiator of the permanent biannual Latin-American symposium for water treatment by advanced oxidation processes (SILAPAO) that took place in 2006 and 2008 in Colombia. The project has created bonds between Colombian and Africa institutions with the purpose of developing a South-South partnership

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The project has been managed in agreement with the 11 rules of KFPE for the scientific partnerships with developing countries.