# COMBINED SOLAR PHOTOCATALYTIC – STRIPPING REACTOR FOR MINERALIZATION OF POLICHLOROBENZENE POLLUTED WATERS

A new combined solar photocatalytic/stripping reactor has been developed in order to pre-purificate waters contaminated by chlorobenzene residues. This reactor is supplied with a transparent cover to utilize both the UV and the visibile plus close IR components of the solar radiation.

Chlobenzenes are persistent, poisoning, biologically non-degradable or very hard degradable materials. They cannot be digested by bacteria since the formation of chloridic acid in the process kills them.

To solve the problem of mineralization of such polluted waters it was developed a new plant –based on physico chemical principles only- able to purificate the liquid via a combined effect of UV irradiaton by sun and $TiO_2$ catalyst activation, heating of raw material through IR sun radiation, air stripping and final treatment of reactants and recovery of products.

It is known that molecules can be activated not only by thermal treatment but also by irradiation with photons provided that molecule is able to absorb the photon at the given wavelength. If the energy of the absorbed photon is equal to or higher than the bond energy between the atoms of the molecules, the molecule can dissociate to free atoms and radicals that have an extremely high reactivity and in presence of oxidizing agents total mineralization of the molecule to $CO_2$ and HCl can be achieved.

The process of natural sun UV mineralization of chlorobenzene is very slow both to the small amount of UV on earth surface and poor activation of molecular bond. Therefore the proposed plant uses an appropriate catalyst as the powder of $TiO_2$ to speed up by a factor of several thousands the dissociation of chlobenzene chemical bonds and oxidation in air.

A detailed description of the prototype is given in the following with the help of a few images.

- Figure 1 shows a simplified reactor mounted in a lab where a reactor exposed to UV, IR solar radiation carries a thin flow of polluted water mixed with catalyst. A storage polluted water/catalyst tank is connected to the reactor
- Figure 2 shows an evolution in the reactor where an air stripping phase is added in order to collect the evaporation of chemicals as an effect of warming up of raw material, and a following catalyst treatment of chlorobenzene in gas phase: in this evolution polluted water is treated then in the liquid and in gas phase
- Figure 3 is an artist view of a mobile truck that carries 4 reactors in order to expand the capability, and all the ancillary laboratory needed to monitor the process, storage the liquids and reactants
- Figure 4 is a complete flow sheet of the treatment process as it is envisaged in the patent, from raw polluted water storage, storage of catalyst, air stripping forced circulation, cleaning of air, etc.

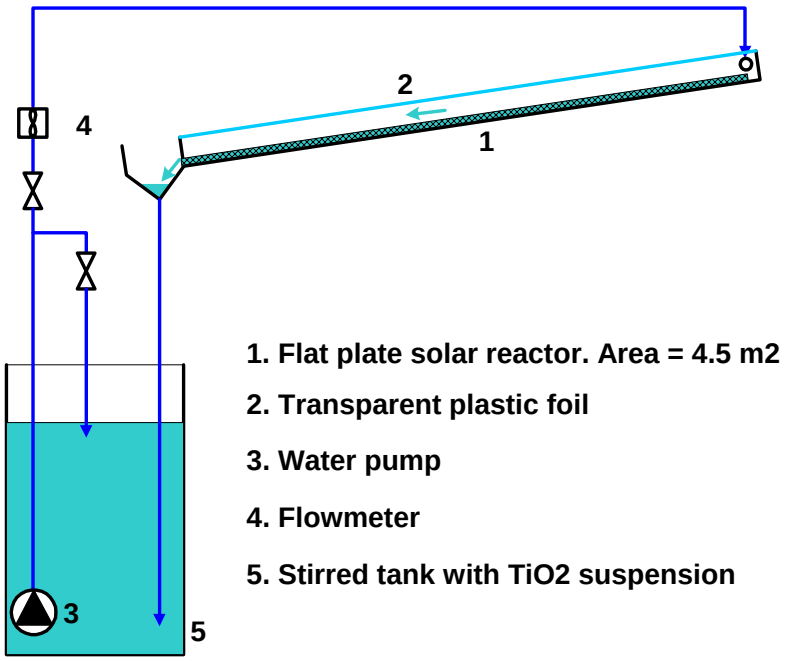


Figure 1.
Flow sheet of a lab solar photocatalysis reactor with TiO2 powder mixed continuosly

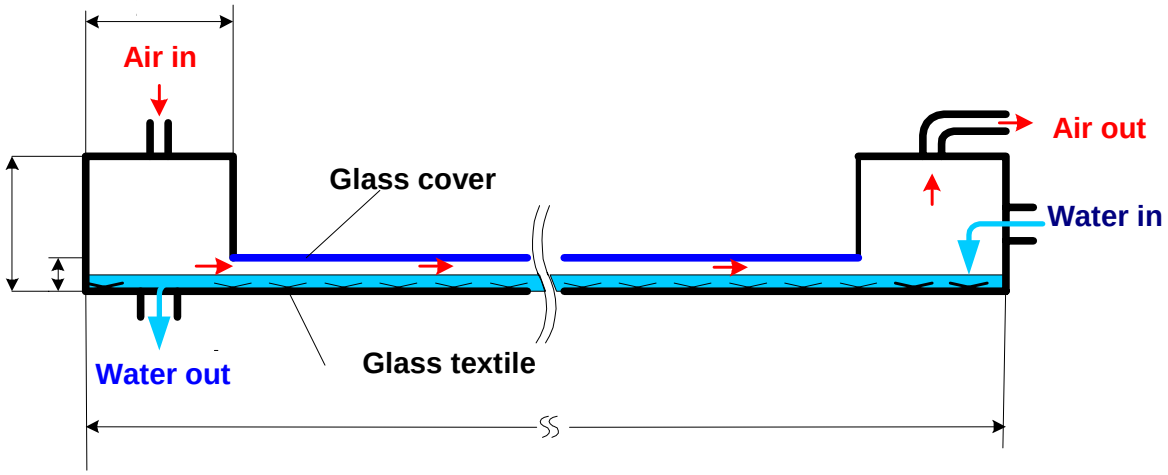


Figura 2.
Photocatalytic reactor with TiO2 absorbed in a glass textile support integrated by continuous air stripping

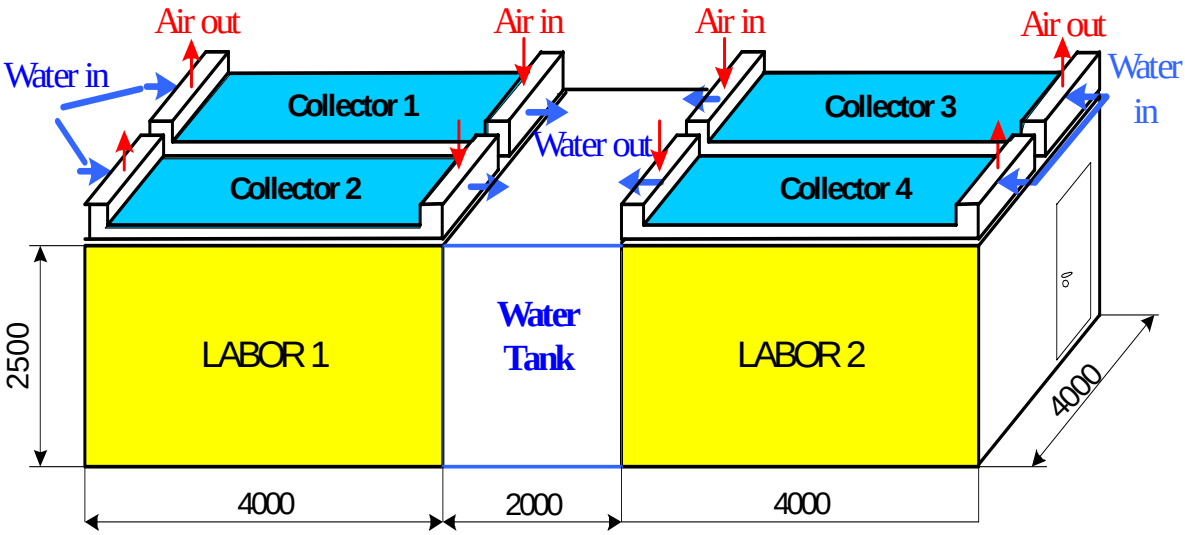


Figure 3.
Scheme of a 4 reactor installation with ancillary lab monitoring mounted on a mobile track

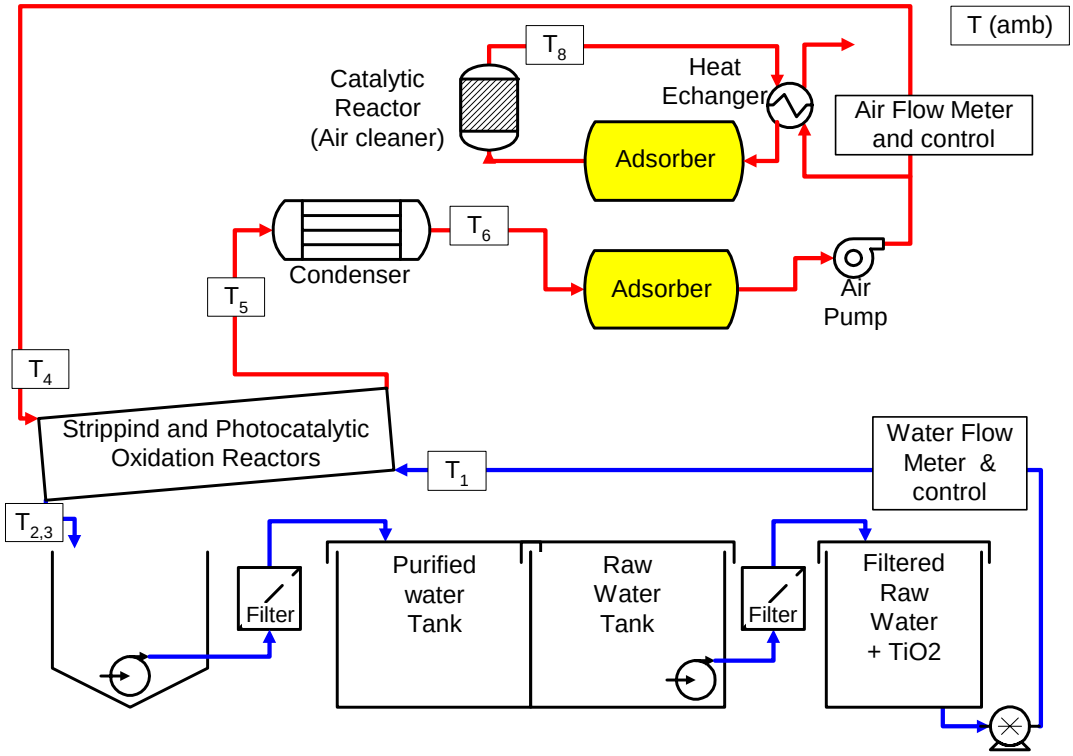


Figura 4.
Flow sheet of a complete set of photocatalytic reactor/air circulation/fluids storage/gas treatment of prototype plant