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ELIMINATION OF AN ANTIBIOTIC BY HETEROGENEOUS SOLAR PHOTOCATALYSIS

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INTRODUCTION

Every year thousands of tons of pharmaceutical products are used in human and veterinary medicine to treat diseases, bacterial infections, etc., to also stimulate the growth of agricultural and aquaculture farms. However, their use is often partially metabolized by the body, so these substances or their metabolizes are continuously discharged into wastewater treatment plants. The latter are the main sources of dispersion of pharmaceutical compounds in the environment. Therefore, their presence and accumulation in natural waters constitutes an emerging pollution leading to the disruption of ecosystems. The effect of pharmaceutical pollutants on health and their ecological risks requires the development of more efficient processes to degrade refractory and recalcitrant pollutants [1] et [2].

This work aims to study the effectiveness of treatment by heterogeneous solar photocatalysis in the presence of a catalyst (ZnO) in order to clean up the water loaded with the antibiotic ciprofloxacin.

RESULTS AND DISCUSSION

- Under optimal conditions, treatment by solar photocatalysis in the presence of ZnO showed a ciprofloxacin elimination of 87% is obtained after 240 min of treatment.

The degradation of ciprofloxacin is observed, by the disappearance of the absorption peak of the antibiotic during the treatment time. The relevance of the treatment by solar photocatalysis in the presence of ZnO is confirmed..

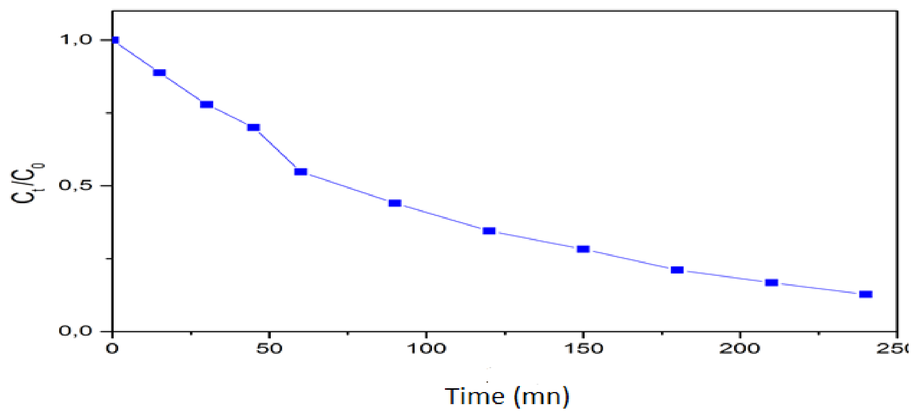

Figure 1: degradation of ciprofloxacin by solarphotocatalysis under optimal conditions(C_0 = 10 mg/L, pH = 6 (not adjusted), dose of ZnO = 0.1 g/L)

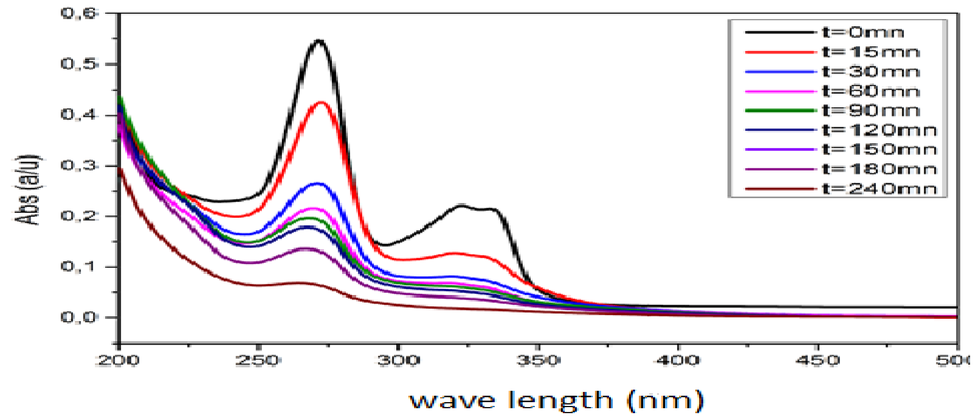

Figure 2 : Spectral evolution of ciprofloxacin during treatment under optimal conditions (C_0 = 10 mg/L , pH=6 (not adjusted), dose of ZnO=0.1g/L)

Analysis by infrared spectroscopy showed that only two groups are obtained O-H and C=O at 3500 cm^{-1} and 1600 cm^{-1}, respectively after 240 mn of oxidation.

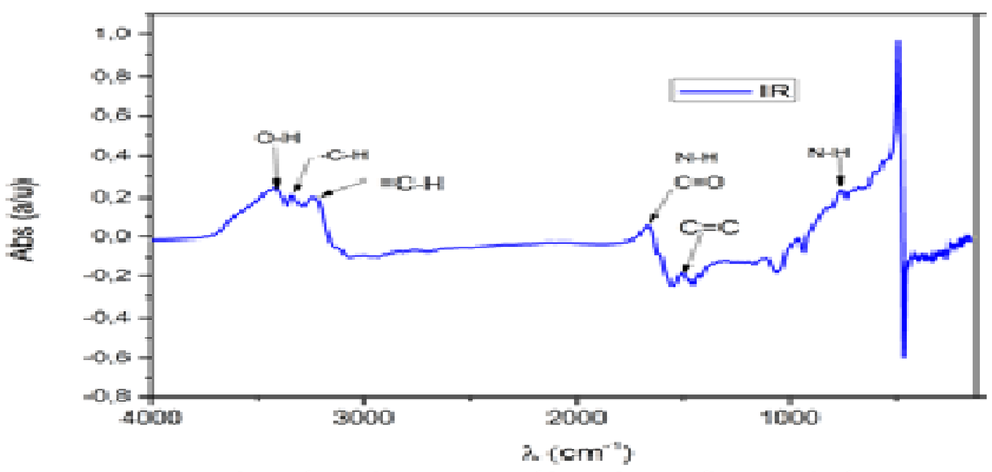

Figure 3 : the infrared spectrum of liquid ciprofloxacin before treatment

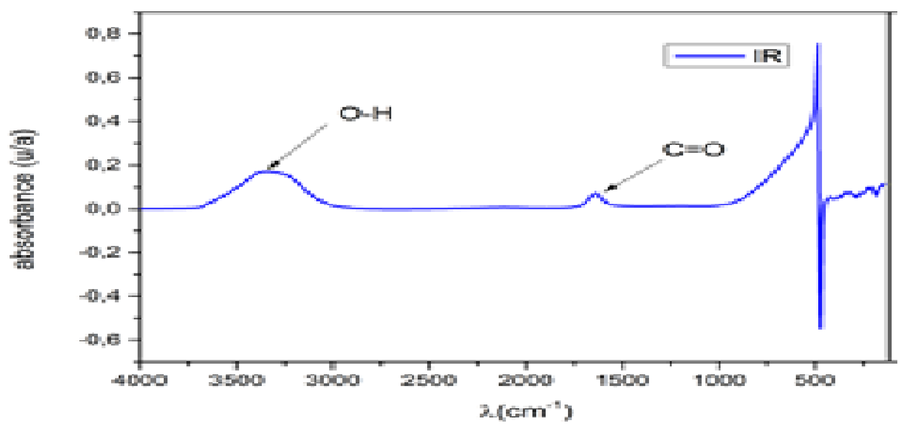

Figure 4: the infrared spectrum of liquid ciprofloxacin after treatment

The BOD_5/COD ratio increased from 0.005 initially to 0.46 after 240 min of ciprofloxacin treatment by solar photocatalysis. The efficiency of the solar photocatalytic process is shown.

CONCLUSION

At the end of these results obtained during this study, solar photocatalysis proves to be very effective for the degradation of the studied pharmaceutical pollutant and therefore a very useful technique to reduce water pollution while reducing the energy cost of the treatment.In this context, the exploitation of solar radiation is very interesting, particularly in a country like Algeria where the solar potential is very important, so it is interesting to apply the results obtained on a large scale and this, through the design a pilot fixed-bed photoreactor for the treatment of biorecalcitrant pharmaceutical effluents.

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