

# DECOLORIZATION OF AZO DYE TEXTILE ACID BROWN 75 BY ADVANCED OXIDATION PROCESS AND OPTIMIZATION OF OPERATING PARAMETERS.

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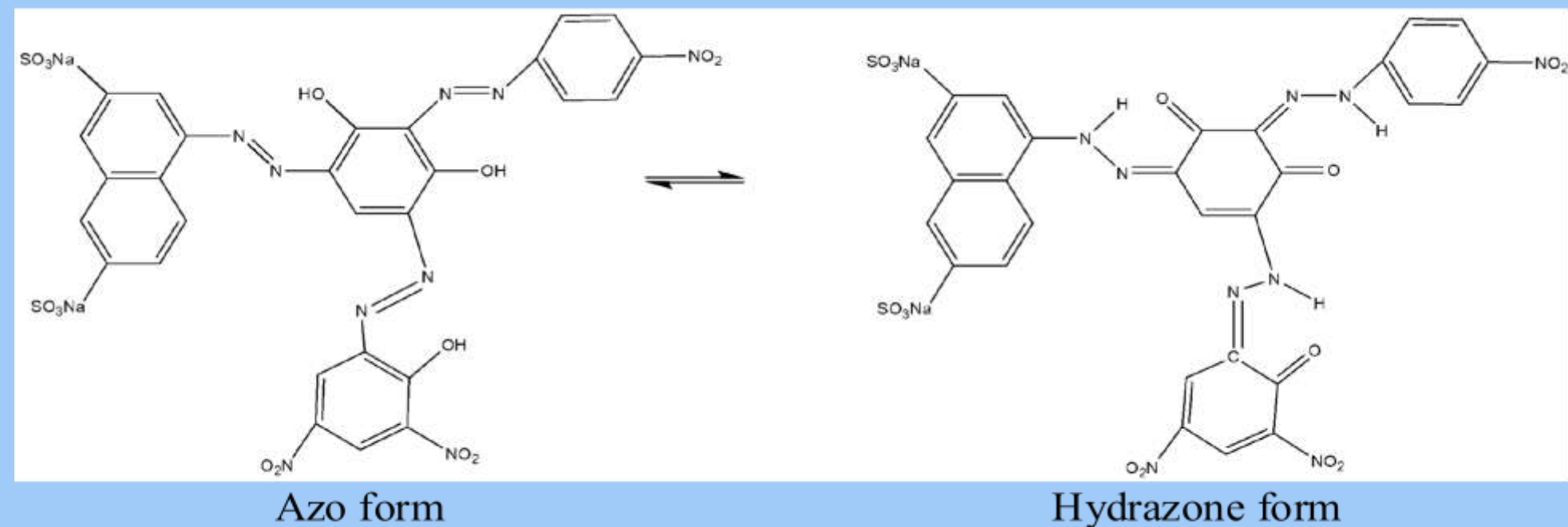
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The photooxidation of textile dye Acid Brown 75 (AB75) was investigated with the goal of determining a rate expression for the decolourization kinetics using H<sub>2</sub>O<sub>2</sub>/UV with a high Hg UV lamp. The effects of reaction pH, applied H<sub>2</sub>O<sub>2</sub> dose and temperature have been studied using a continuous circulation photoreactor.

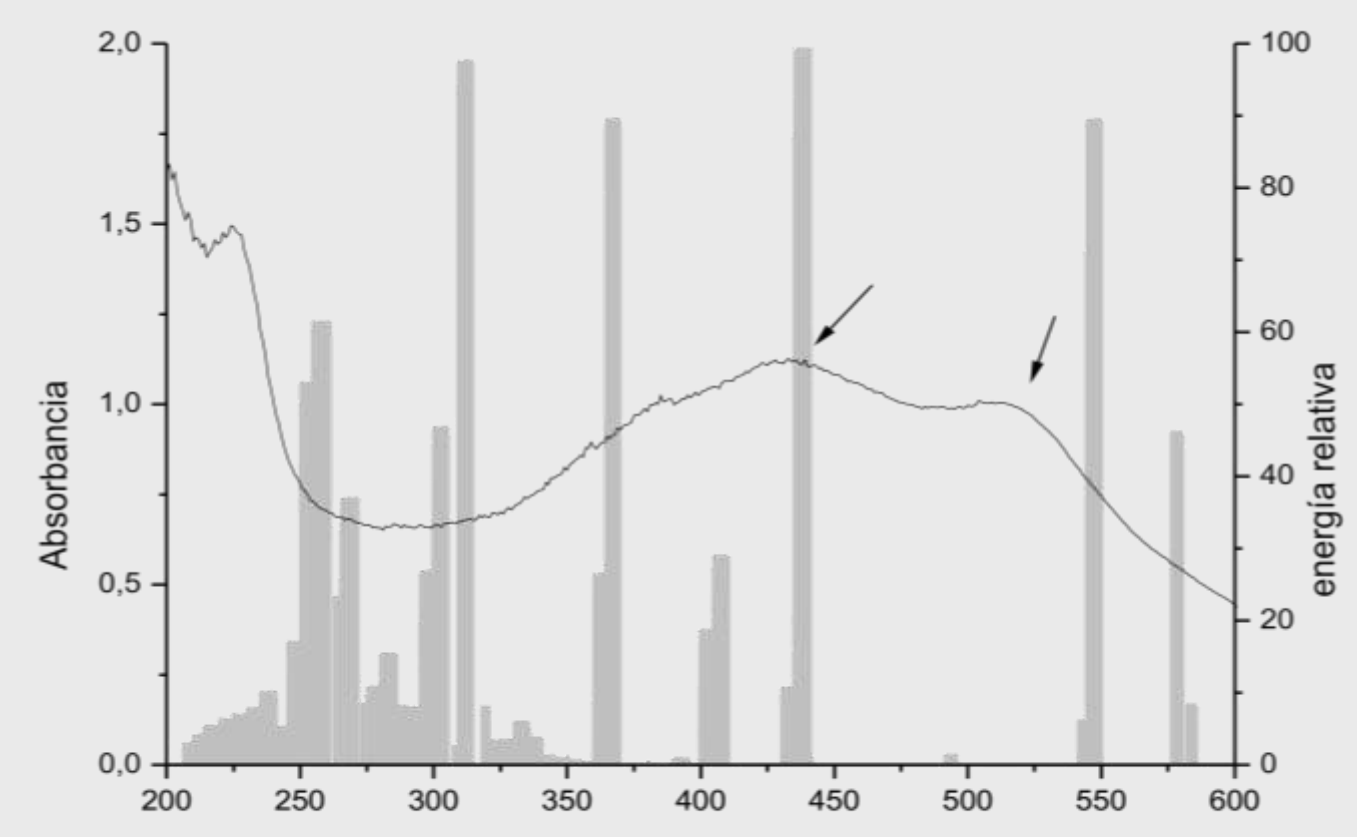
## EXPERIMENTAL PART

### MATERIALS

Dye: AB75 supplied by Basf Curtex, S.A

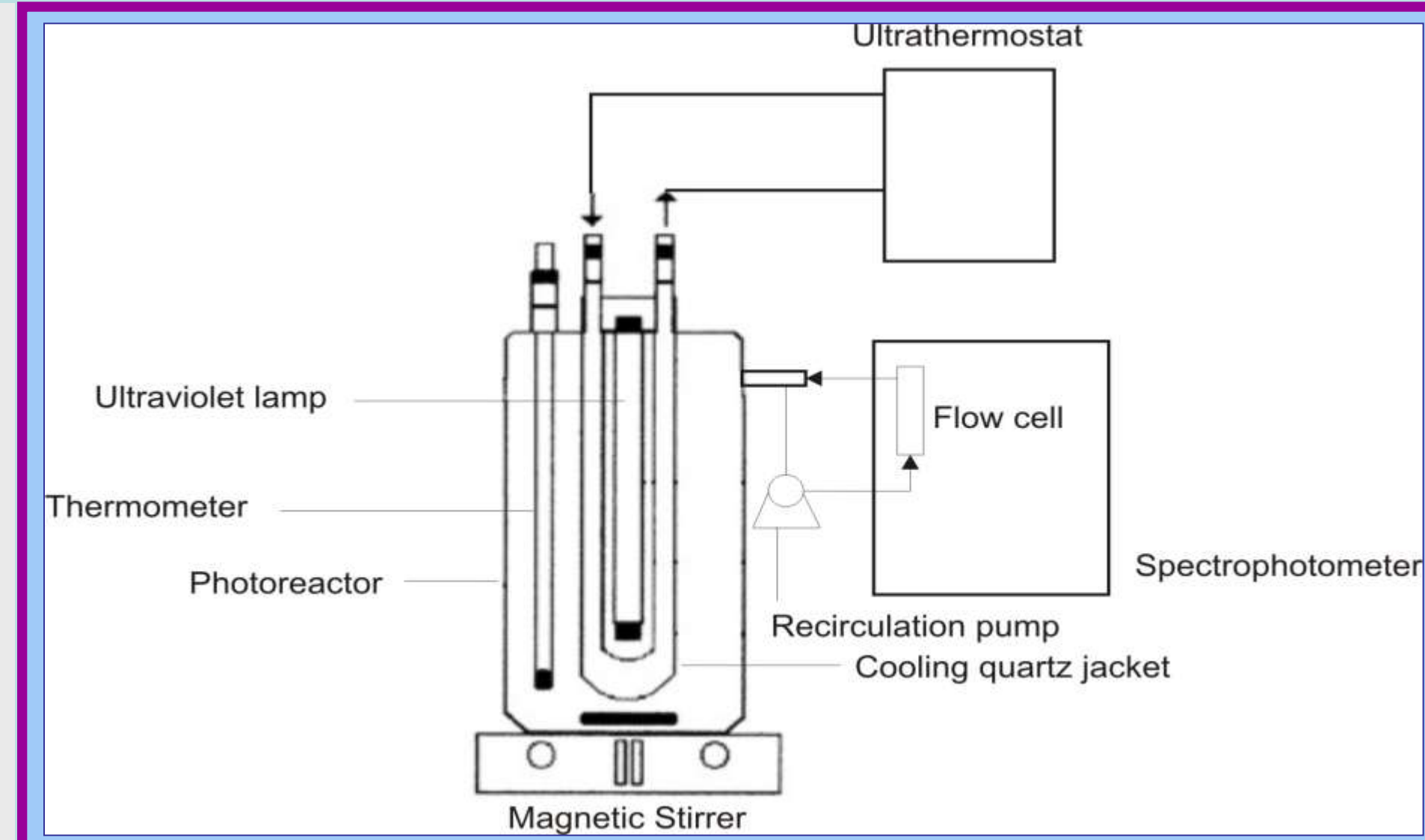


Tautomeric forms of AB75 dye in solutions



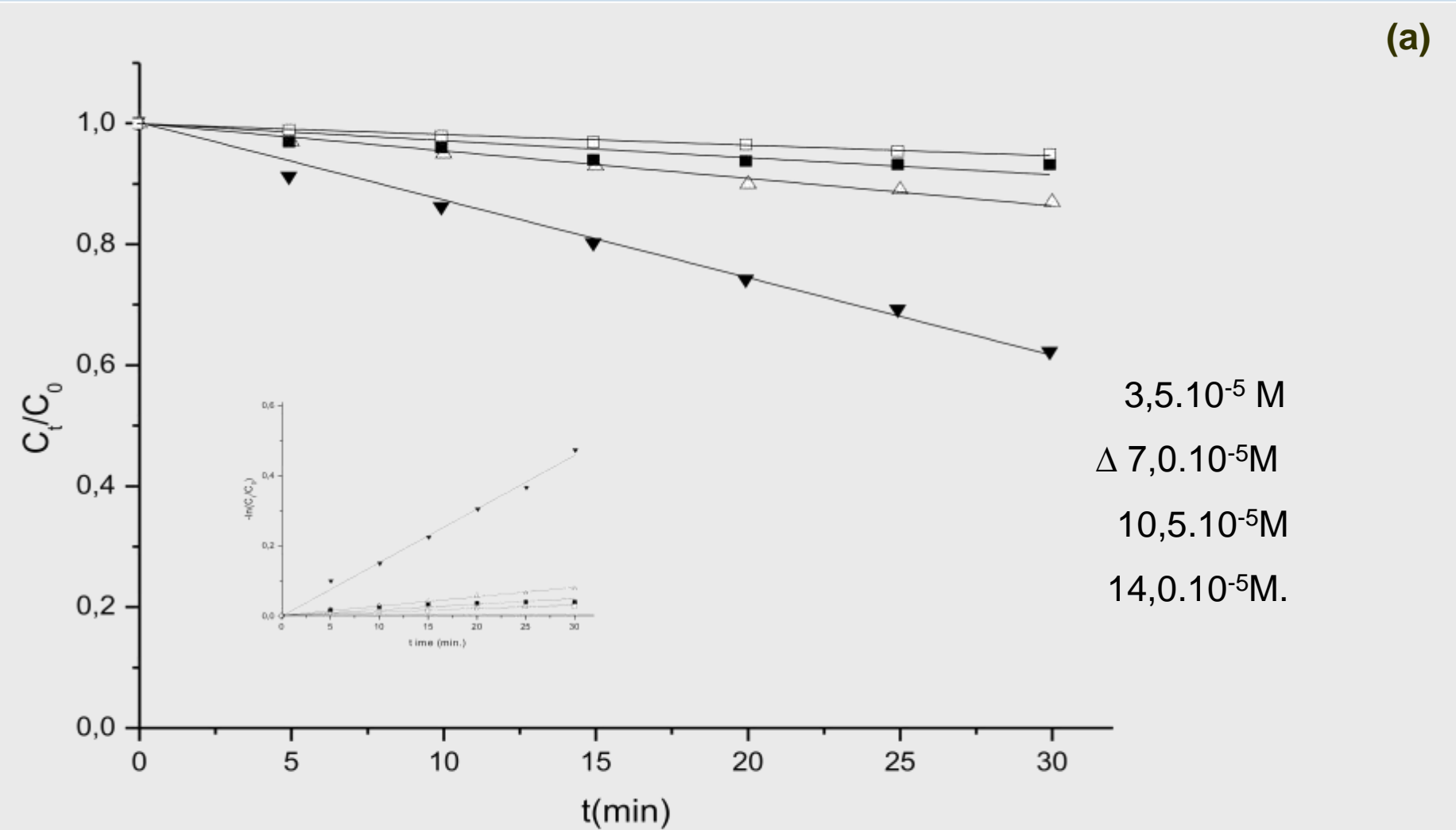
UV/Visible absorption spectra of AB75 dye together with emission spectrum of the lamp. [AB75] = 3,5 x 10<sup>-5</sup> M, initial pH = 6,8, T= 296 K, UV radiation dose = 29,21 W.

### PHOTOTREATMENT SYSTEM

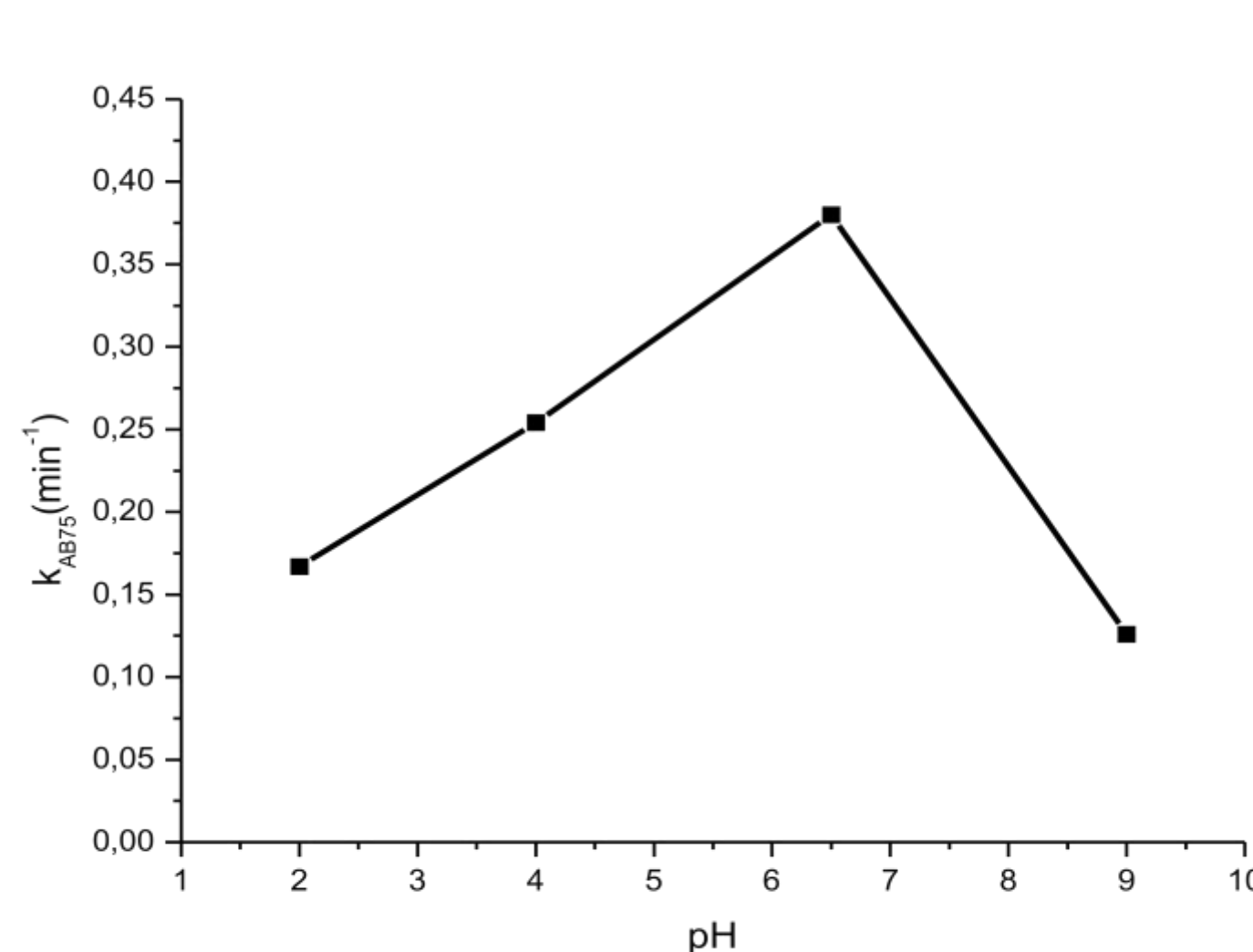


## RESULTS AND DISCUSSION

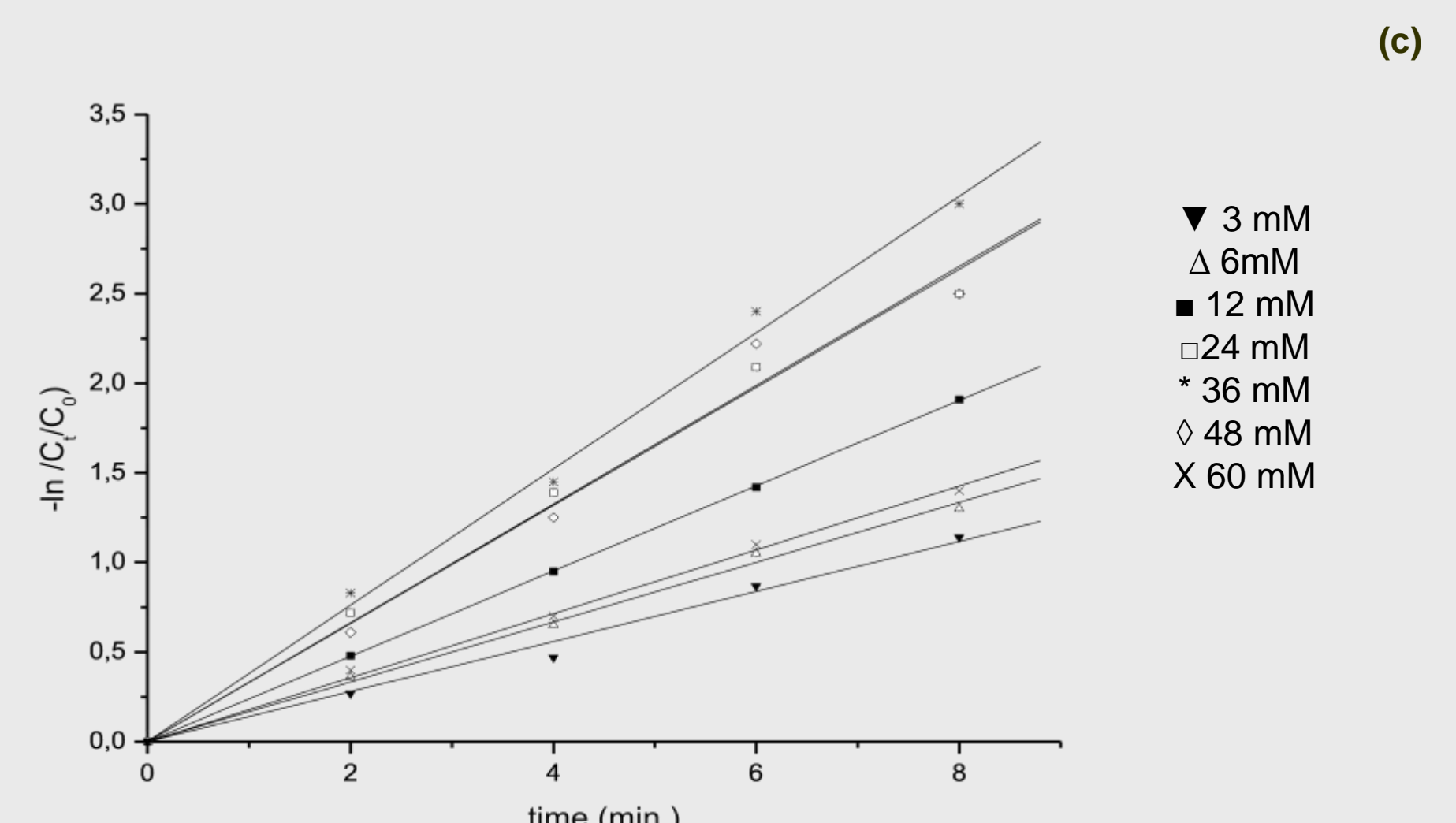
Photocatalytic degradation of AB75. Effect of: (a) concentration; (b) pH; (c) concentration of H<sub>2</sub>O<sub>2</sub>.



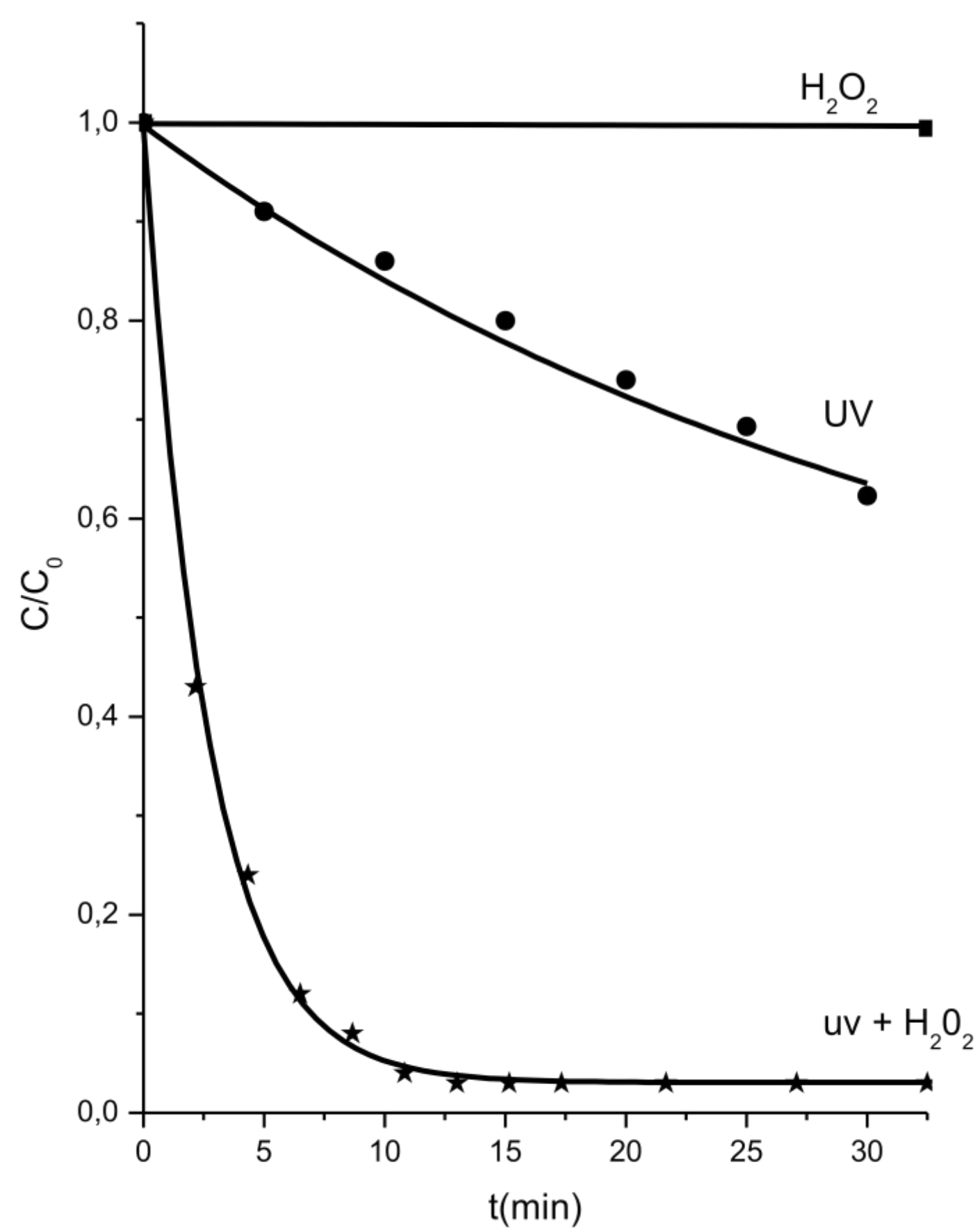
Evolution of the dye concentration at 430 nm. Insert: Kinetics pseudo-first order of decolourisation monitored. T=296 K, dosis UV=29,21 WKg<sup>-1</sup>, pH=6, [O<sub>2</sub>]<sub>dis</sub>=2,75.10<sup>-4</sup> moldm<sup>-3</sup>



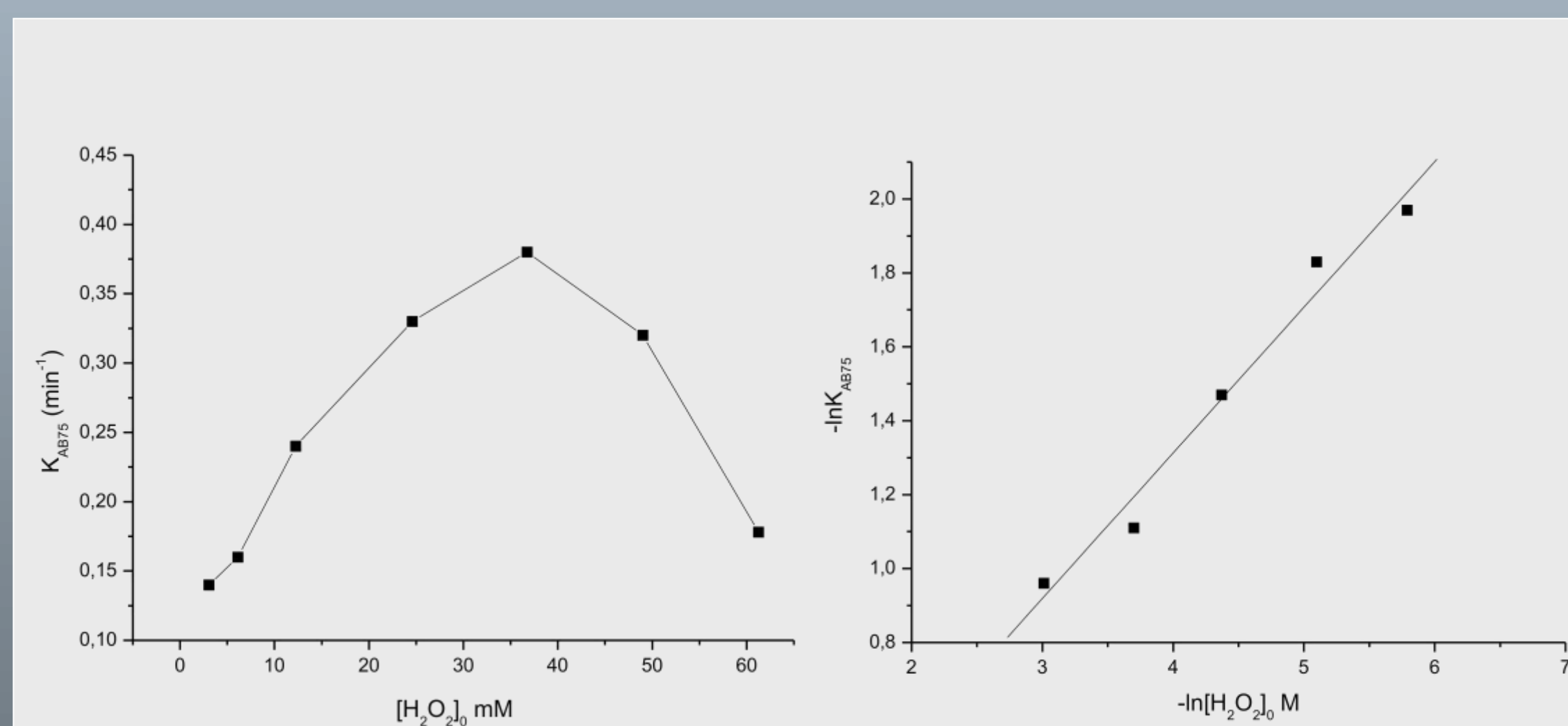
Effect of the pH of the dye solution at the pseudo-first order rate constant. [H<sub>2</sub>O<sub>2</sub>]<sub>0</sub>=36mM; T=296K



Initial concentration of the AB75 =3,5 x 10<sup>-5</sup> M, initial concentration of H<sub>2</sub>O<sub>2</sub> = 10<sup>-2</sup> M, initial pH of the solution = 6,8; temperature = 296°K; UV radiation dose = 29,21 W.



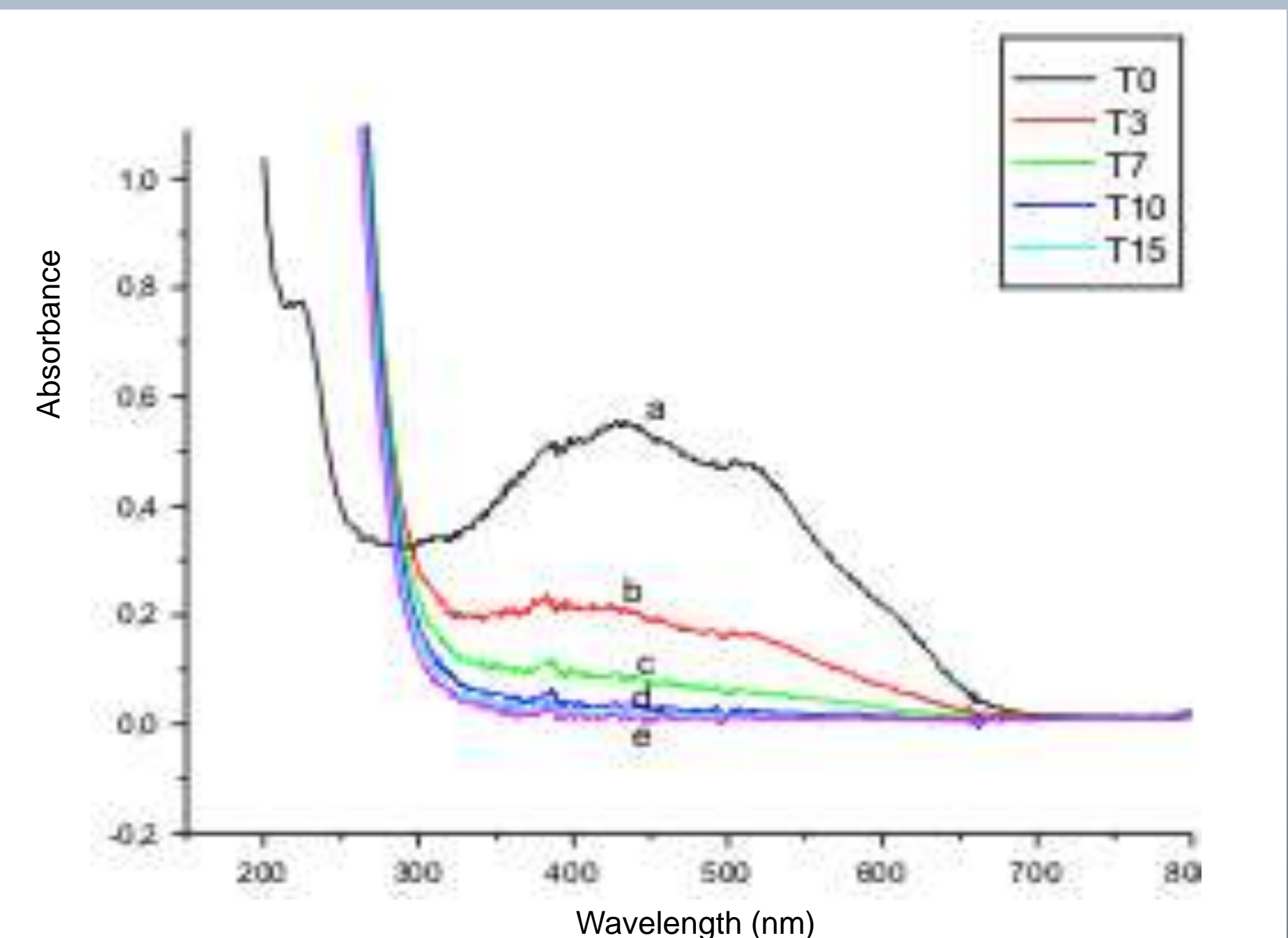
Decolourisation of azo dyes in wastewater by H<sub>2</sub>O<sub>2</sub> alone, UV alone, and UV/H<sub>2</sub>O<sub>2</sub> system. Initial concentration of the AB75 =3,5 x 10<sup>-5</sup> M, initial concentration of H<sub>2</sub>O<sub>2</sub> = 10<sup>-2</sup> M, initial pH of the solution = 6,8; temperature = 296 K; UV radiation dose = 29,21 W.



Effect of the concentration in hydrogen peroxide on the efficiency of photocatalytic degradation of AB75.

Relationship between k<sub>obs</sub> and initial concentration of hydrogen peroxide

$$K_{obs} = 0,77[H_2O_2]_0^{0,39}$$



Evolution of the UV-VIS spectrum of the AB75 (10<sup>-5</sup>M) and hydrogen peroxide an aqueous solution under UV irradiation as the increasing irradiation time (min).



Evolution of the colour as the increasing irradiation time to 15 min.

## CONCLUSIONS

The UV/H<sub>2</sub>O<sub>2</sub> process is a the effective and rapid method for discolouration of dilute aqueous azodye solutions that permit degraded in solution 1,8 .10<sup>-5</sup> M of the AB75 and 3,6.10<sup>-2</sup> M in H<sub>2</sub>O<sub>2</sub> at dissolution natural pH and room temperature in 10 minutes with a UV polychromatic radiation.

This process does not generate toxic subproducts.

The kinetics of the degradation depends on the H<sub>2</sub>O<sub>2</sub> initial concentrations, and on the pH of the solution. Temperature does not have a significant influence.

The rate of decolourisation increased linearly with the increase of initial concentration of H<sub>2</sub>O<sub>2</sub>. It is determined the optimum molar ratio of H<sub>2</sub>O<sub>2</sub> to dye for the process. The UV/H<sub>2</sub>O<sub>2</sub> process using continuous circulation reactor provides good performance in the decolorization treatment of the AB75 in water.

### References

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