DEGRADATION OF XENOBIOTICS BY AOPs

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- CONCLUSIONS

EXPERIMENTAL RESULTS ON DEGRADATION OF HERBICIDE TRIFLURALIN BY PHOTOLYSIS/PHOTOCATALYSIS

- **Dinitroaniline herbicide Trifluralin widely used for weed control in crops,**
- **Its behaviour in the environment vitally important,**
- **Pre-emergence, soil-incorporated herbicide applied on many crops,**
- **in the agricultural use since the early 1960s,**
- **Moderately persistent in soil**

PRIORITY HAZARDOUS SUBSTANCE

ANNEX II: AMENDMENT OF ANNEX X OF DIRECTIVE 2000/60/EC

Annex X of Directive 2000/60/EC is replaced by the following:

Brussels, 17.7.2006
COM(2006) 397 final

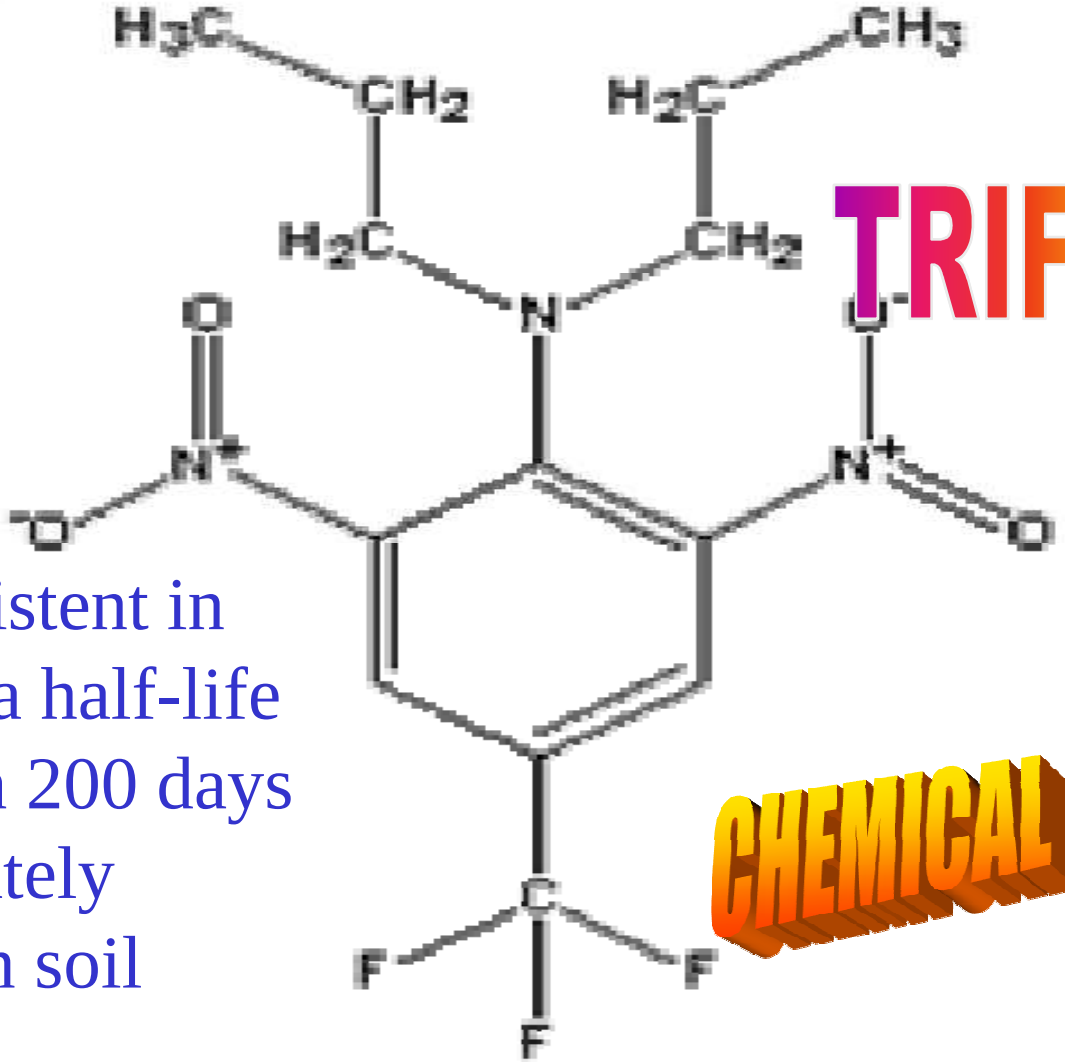
'ANNEX X
LIST OF PRIORTY SUBSTANCES IN THE FIELD OF WATER POLICY (*)

Number	CAS number[1]	EU number[2]	Name of priority substance	Identified as priority hazardous substance
(33)	1582-09-8	216-428-8	Trifluralin	

1 CAS: Chemical Abstract Services

2 EU-number: European Inventory of Existing Commercial Chemical Substances (EINECS) or European List of Notified Chemical Substances (ELNICS).

TRIFLURALIN

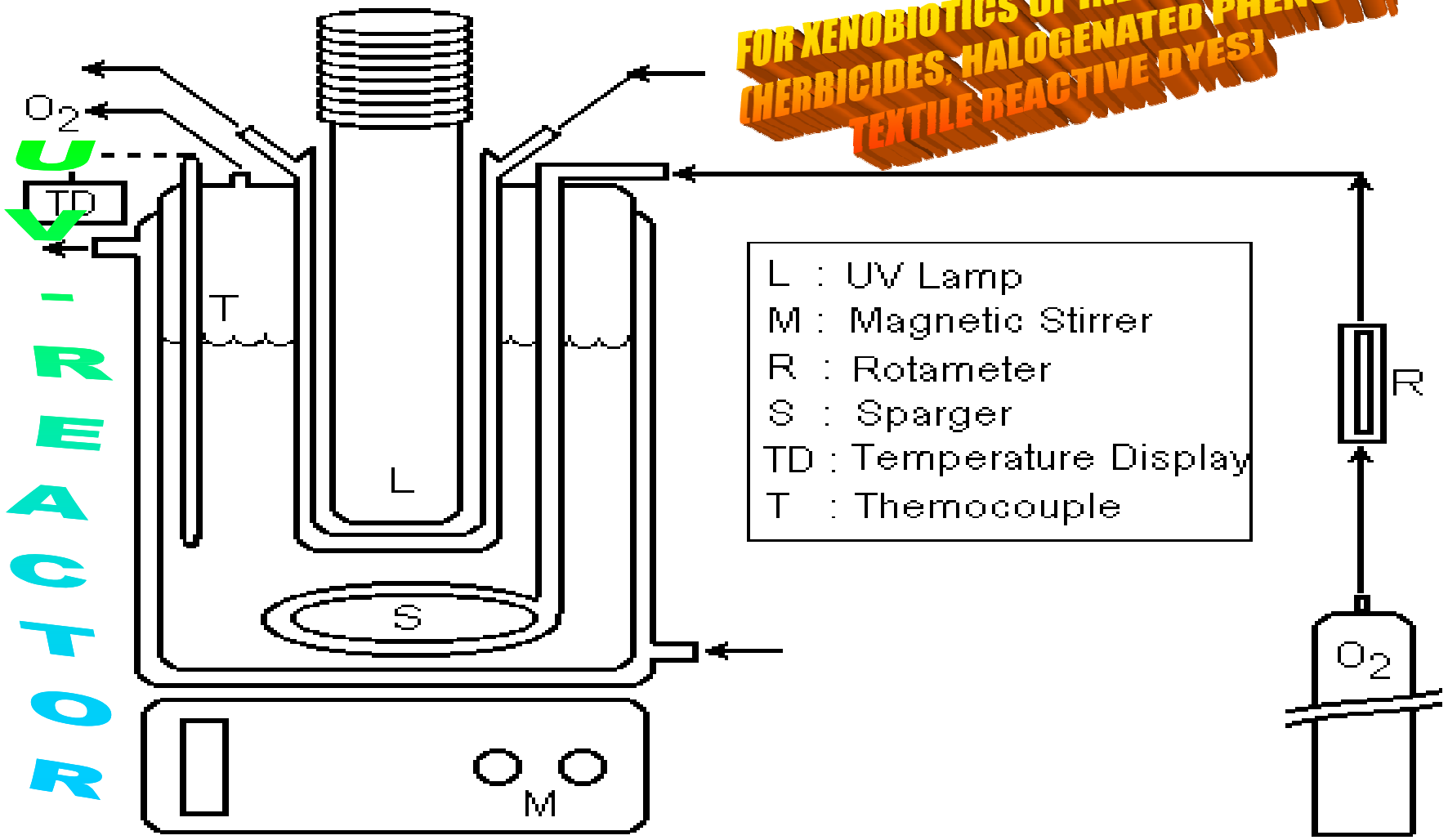


CHEMICAL STRUCTURE

highly persistent in water with a half-life greater than 200 days and moderately persistent in soil

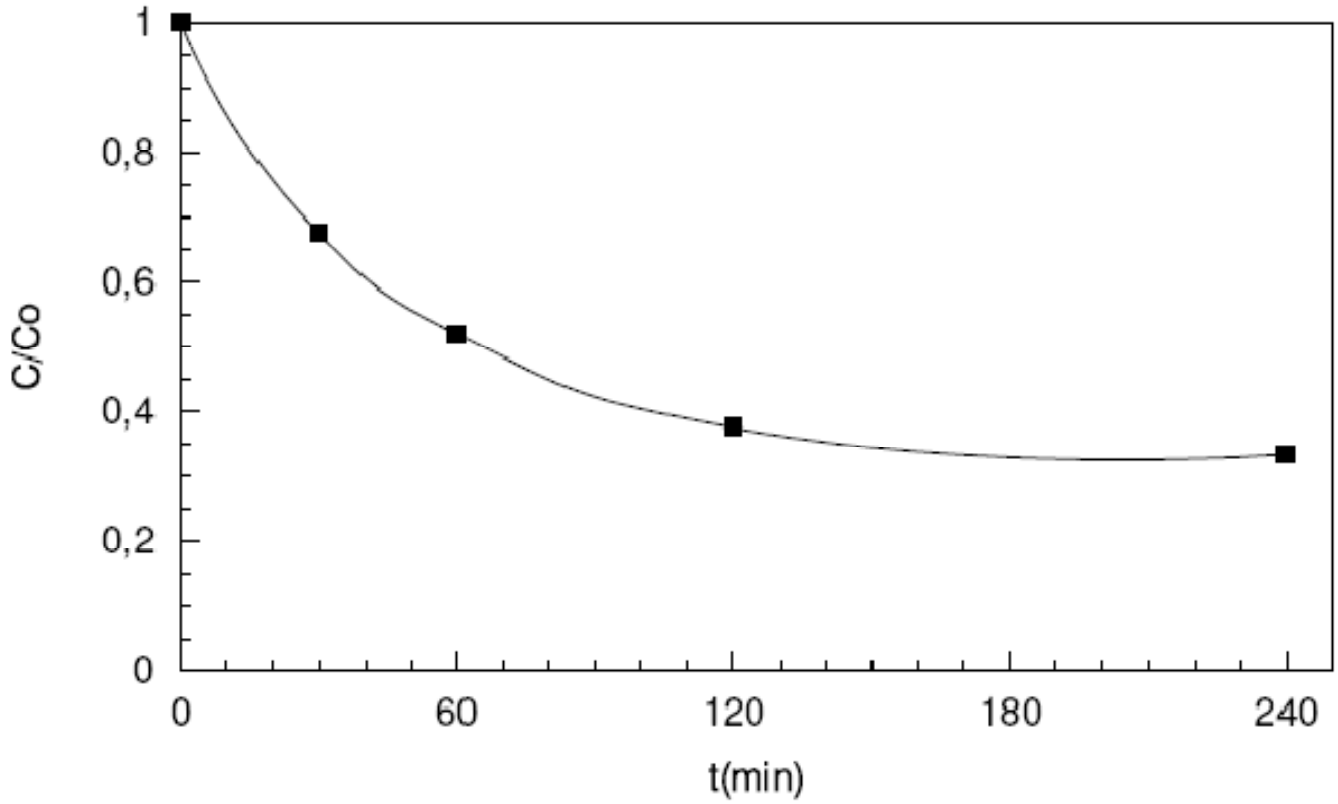
PHOTOLYSIS & TiO2-PHOTO/CATALYSIS SYSTEM

FOR XENOBIOTICS OF INDUSTRIAL WWs (HERBICIDES, HALOGENATED PHENOLS, TEXTILE REACTIVE DYES)



TRIFLURALIN DEGRADATION BY PHOTOLYSIS

Photolytic degradation rate of trifluralin (C_0=3 ppm, pH = 3, Q_{O2} = 3 L min^{-1})



Dimou et al., 2004. Intern. J. Environ. Anal.Chem.,84, 1-3, 173-182

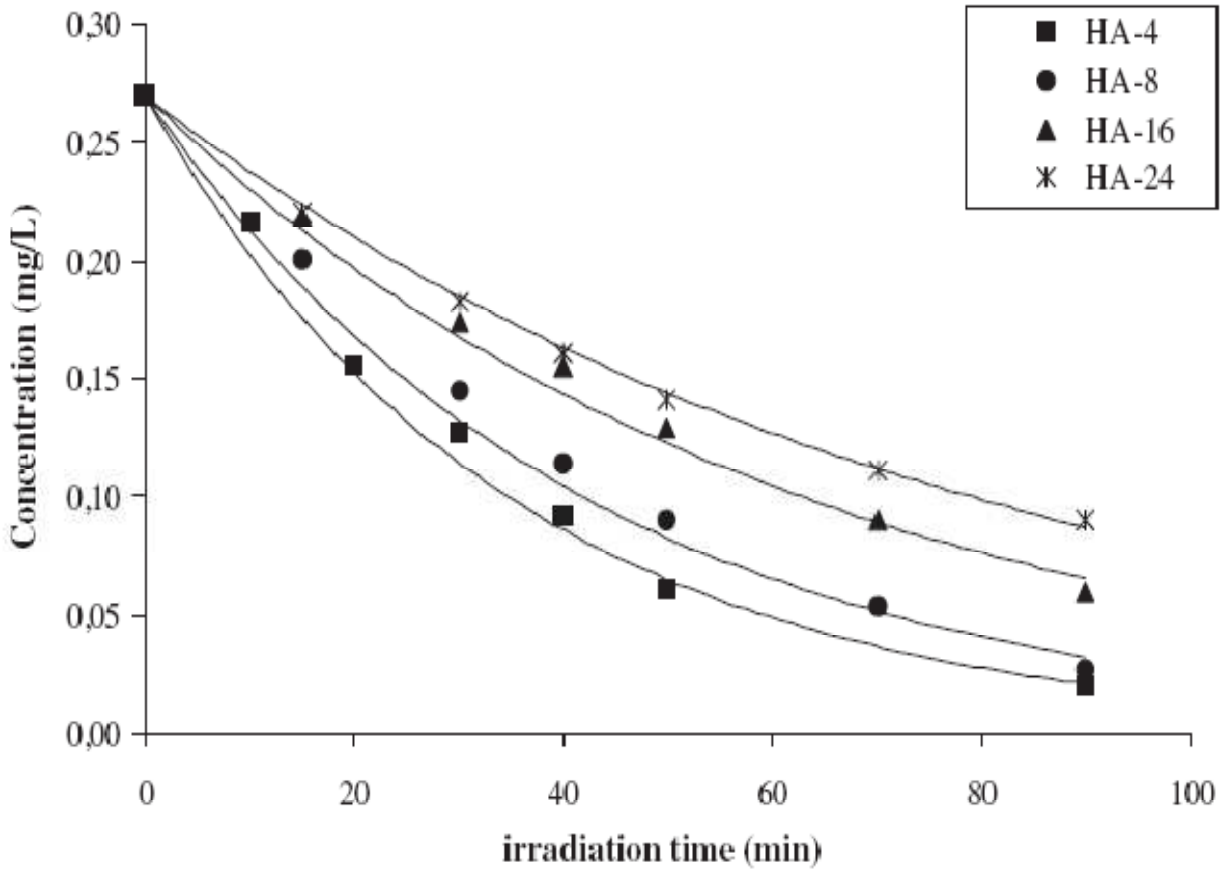
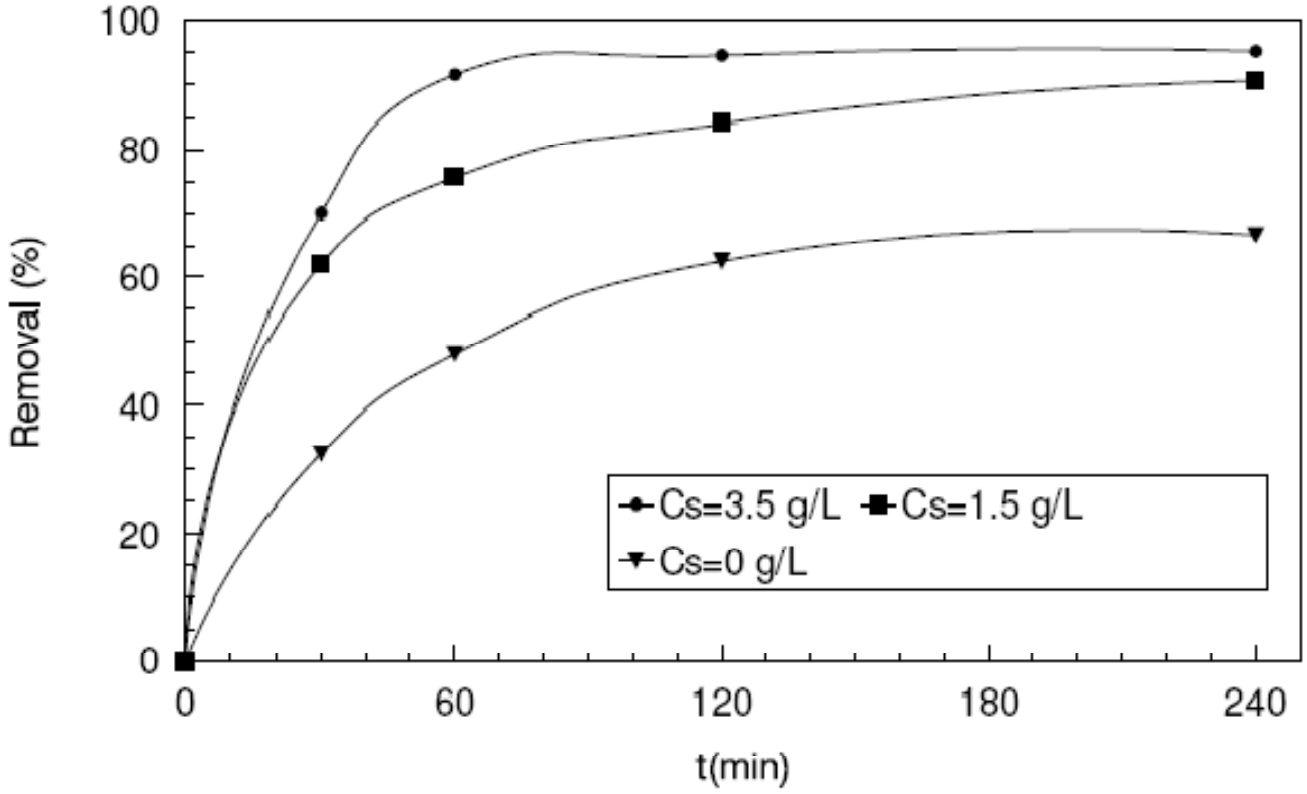


FIGURE 2 The effect of humic acids on the photodegradation rate of trifluralin in distilled water.

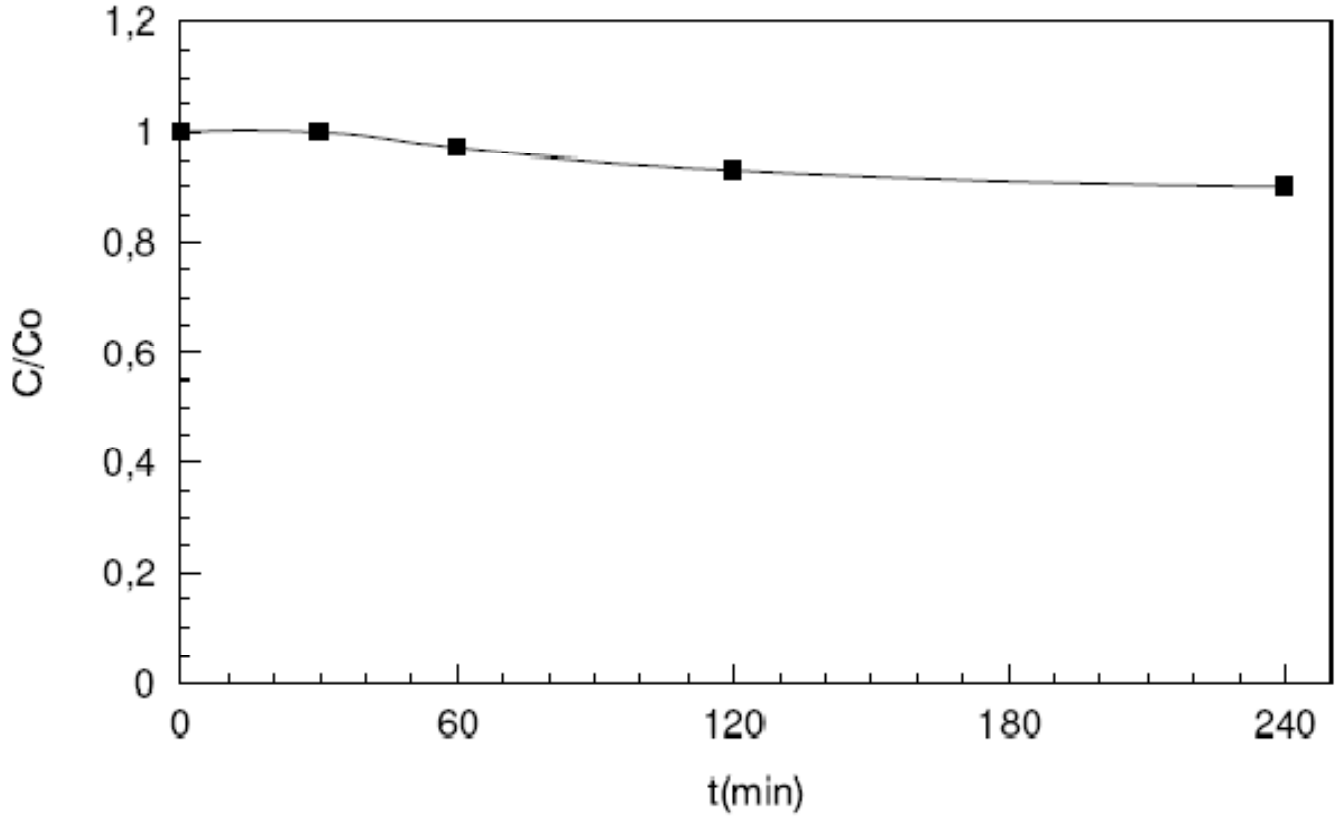
TRIFLURALIN DEGRADATION BY PHOTOCATALYSIS

Photocatalytic degradation rate of trifluralin at different TiO_2 loadings (C_0=3 ppm, pH = 3, Q_{O2} =3 L min^{-1}).



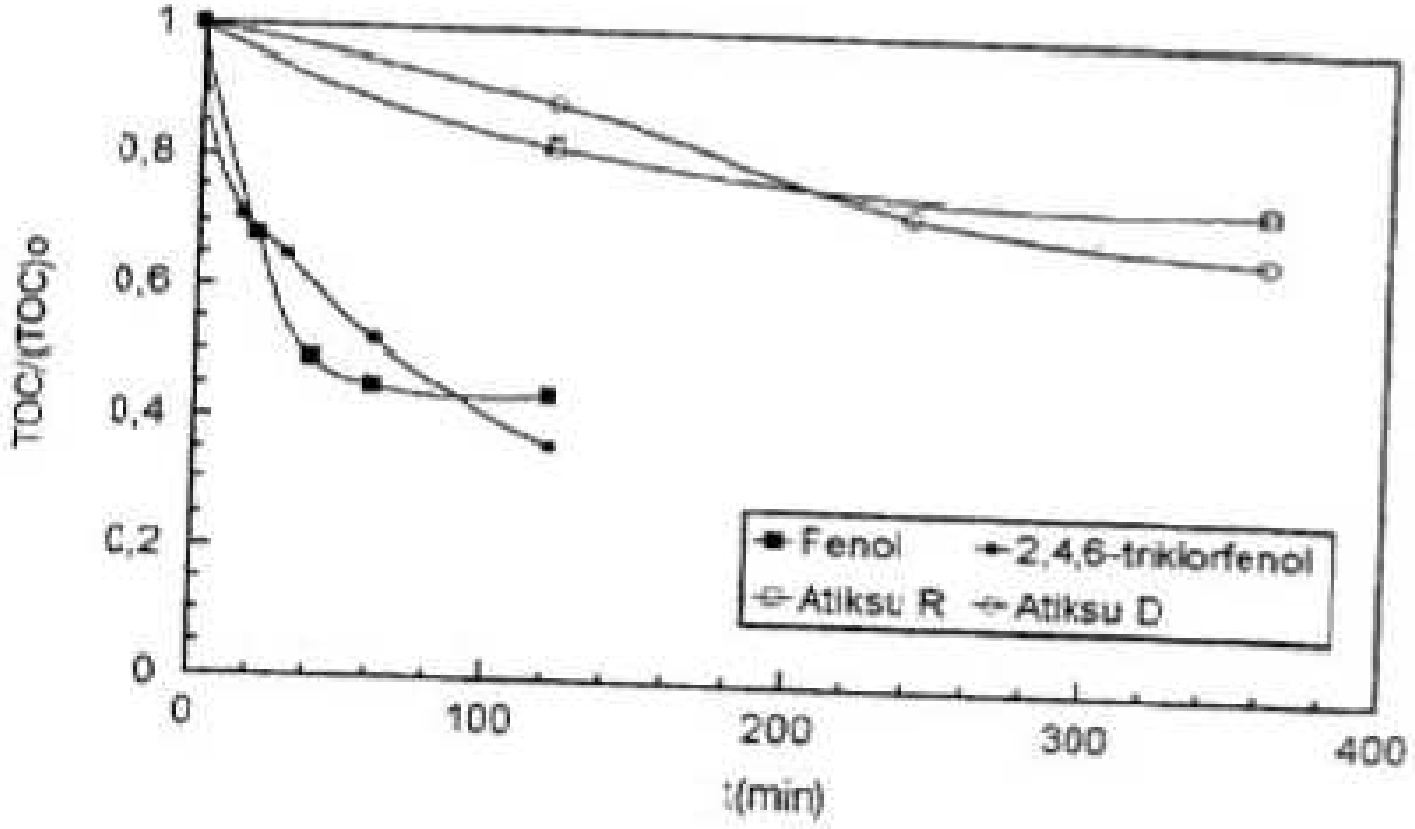
TRIFLURALIN DEGRADATION BY TiO2 CATALYSIS

Catalytic degradation rate of trifluralin with the optimum conditions of Photolysis&TiO2 Phocatalysis (C_0=3 ppm, pH = 3, C_S = 3.5 g L^{-1}, Q_{O2} = 1.5 L min^{-1}).



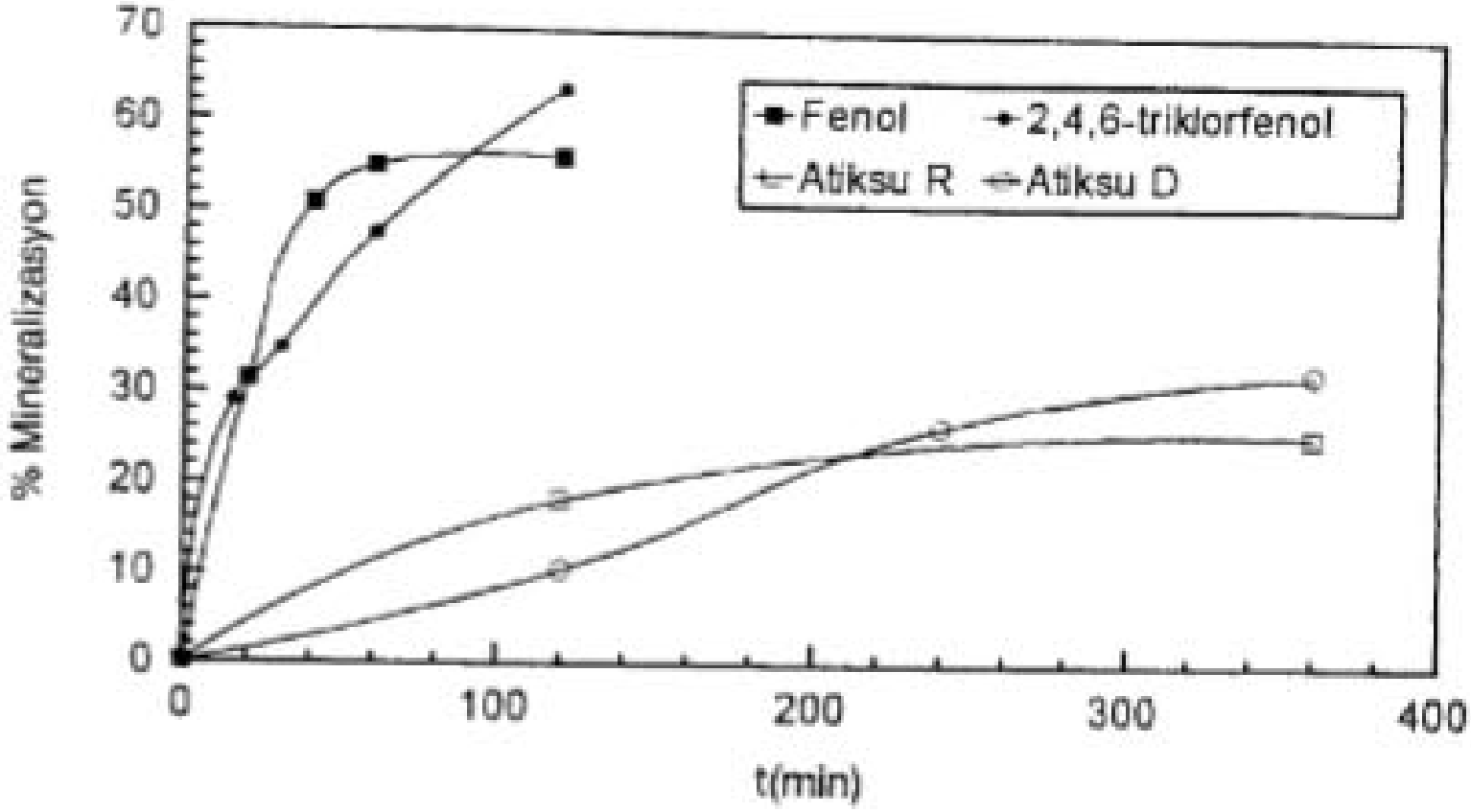
REAL WASTEWATERS CONTAINING PHENOL & CHLORINATED PHENOLIC COMPOUNDS

Photocatalytic degradation rate as fractional TOC removal of Petroleum Refinery (R) and Pulp&Paper Manufacturing (D) Factory WWs with Exp.Conditions:$(TOC)_{0R}$=118 ppm, $(pH)_R$=6,6; $(TOC)_{0D}$=317 ppm, $(pH)_D$ = 3, C_S = 2 g L^{-1}, T=303 K, Q_{O2} = 2 L min^{-1})



REAL WASTEWATERS CONTAINING PHENOL & CHLORINATED PHENOLIC COMPOUNDS

Photocatalytic degradation as % Mineralisation of Petroleum Refinery (R) and Pulp&Paper Manufacturing (D) Factory WWs with exp.conditions: $(TOC)_{0R}$=118 ppm, $(pH)_R$=6,6; $(TOC)_{0D}$=317 ppm, $(pH)_D$ = 3, C_S = 2 g L^{-1}, T=303 K, Q_{O2} = 2 L min^{-1})



EXPERIMENTS ON DEGRADATION OF DIAZO DYE REACTIVE BLACK 5 (RB5) BY PHOTO-FENTON

Objective

- to investigate the degradation of diazo dye of C.I. Reactive Black 5 (RB5) by Photo-Fenton processes in terms of decolorization and COD removal.

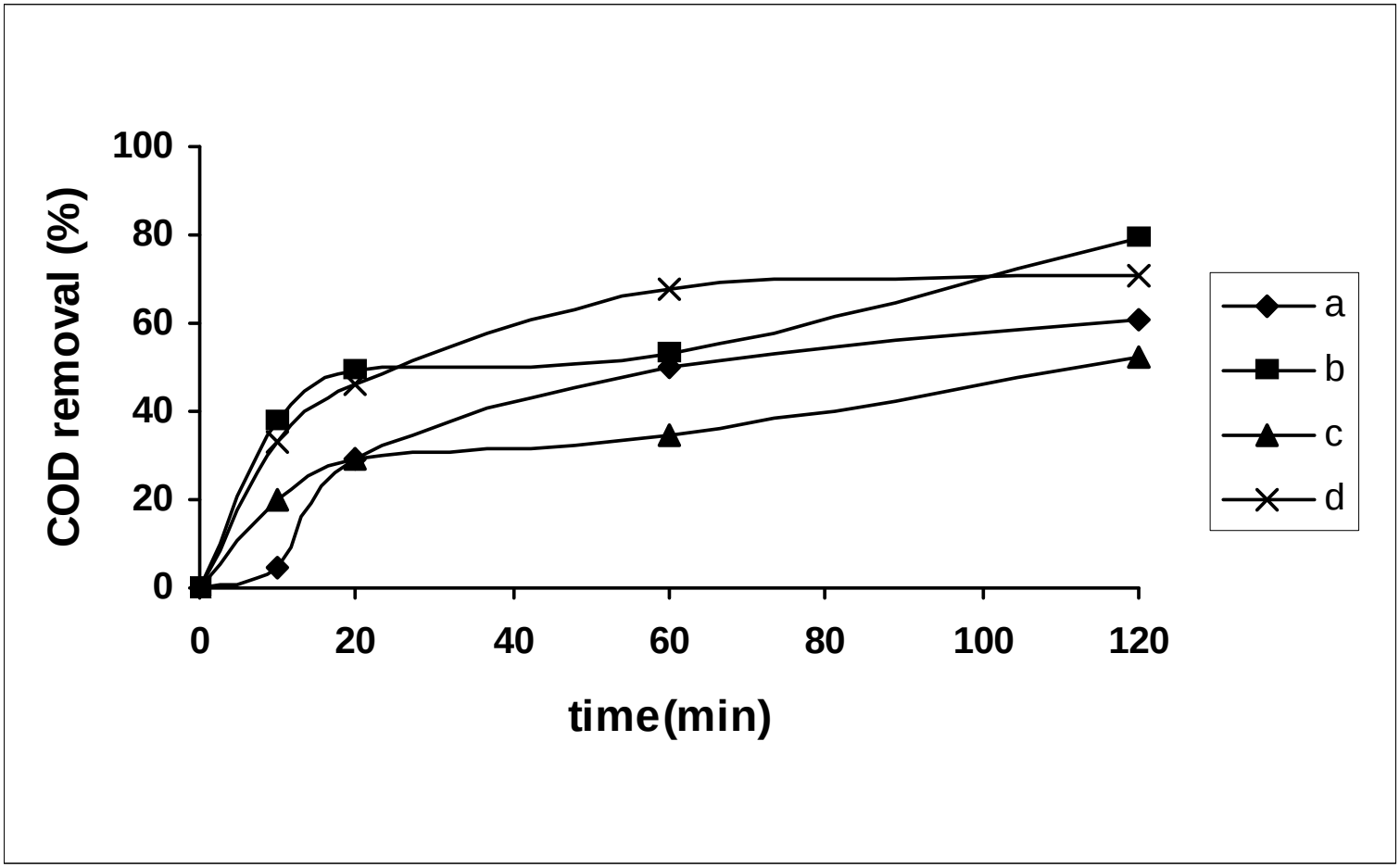
- to examine the effect of the concentrations of RB5, H_2O_2, Fe^{2+} on the color and COD removals.

Method

- Degradation of RB5 was performed by Photo-Fenton ($Fe^{2+}/H_2O_2/UV$), Fenton (Fe^{2+}/H_2O_2) and H_2O_2/UV processes.

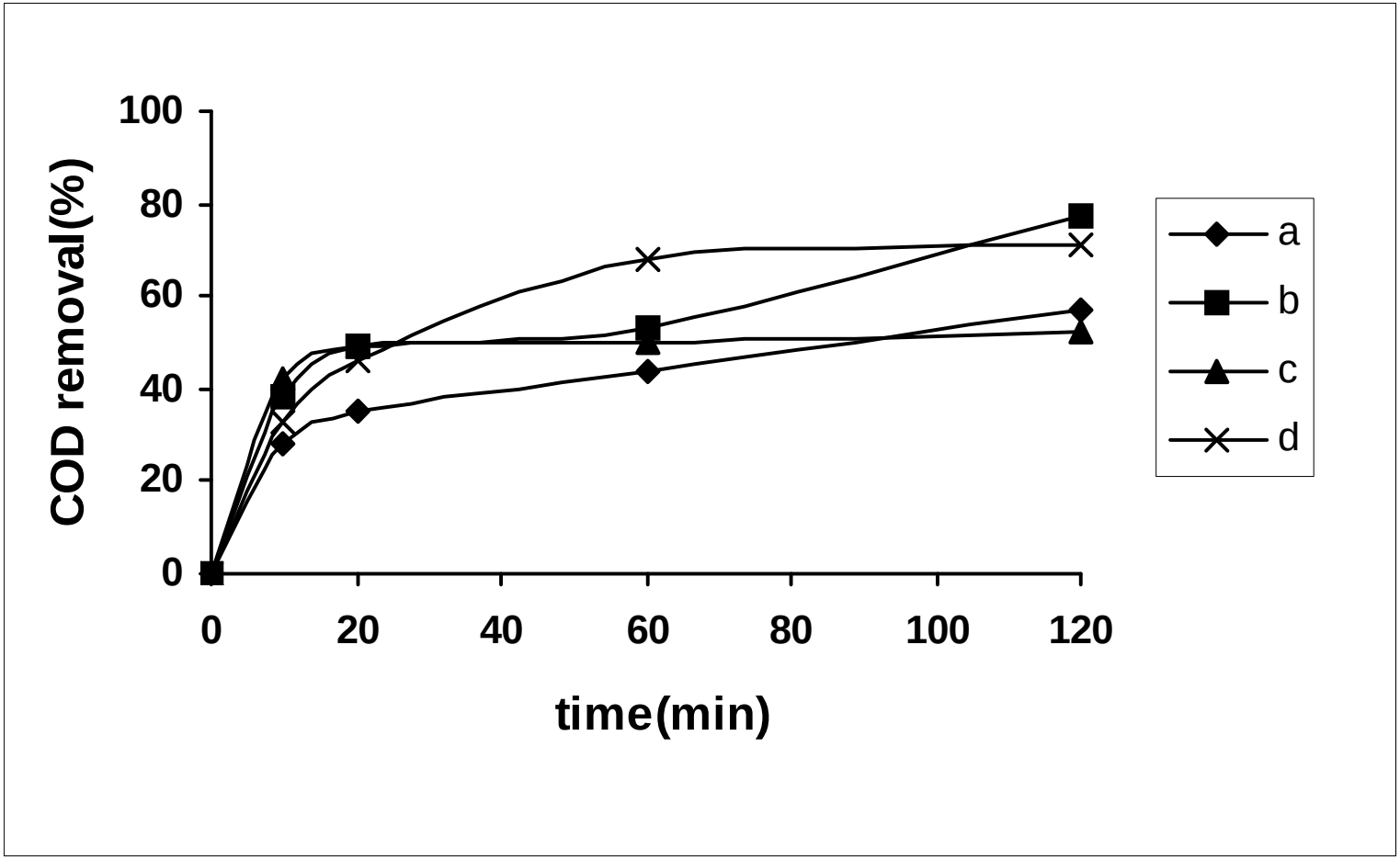
- Experiments were planned by Response Surface Methodology (RSM).

Results: EFFECT OF Fe+2 concentration



a.[RB5]=100 mg/L, [H2O2]=450 mg/L, [Fe2+]=10 mg/L
b.[RB5]=100 mg/L, [H2O2]=450 mg/L, [Fe2+]=28 mg/L
c.[RB5]=300 mg/L, [H2O2]=450 mg/L, [Fe2+]=10 mg/L
d.[RB5]=300 mg/L, [H2O2]=450 mg/L, [Fe2+]=28mg/L

Results: Effect of H2O2 concentration



a.[RB5]=100 mg/L, [H2O2]=150 mg/L, [Fe2+]=28 mg/L
b.[RB5]=100 mg/L, [H2O2]=450 mg/L, [Fe2+]=28 mg/L
c.[RB5]=300 mg/L, [H2O2]=150 mg/L, [Fe2+]=28 mg/L
d.[RB5]=300 mg/L, [H2O2]=450 mg/L, [Fe2+]=28 mg/L

CONCLUSIONS

- only 5 % catalytic degradation rate of trifluralin by TiO_2 (weak adsorption effect),
- Degradation rate of Trifluralin increase to 60 % by Photolysis (UV)
- over 90 % Degradation rate of Trifluralin by TiO2 Photocatalysis
- only 30% mineralization rate over 6 h photocatalytic treatment of the real wastewaters of refinery and pulp&paper manufacturing industries

CONCLUSIONS

- **[RB5]** ⇗ COD % ⇘
- **[H_2O_2]** ⇗ COD % ⇗
- **[Fe^{2+}]** ⇗ COD % ⇗

CONCLUSIONS

The application of RSM yielded for the RB5 degradation the following regression equation:

$$Y = 63.84 - 6.55x_1 + 9.77x_2 + 5.56x_3 + 5.50x_2x_3 - 5.47x_3^2$$

Y:response (% COD);

x_1: coded value of independent variable [RB5],

x_2 : coded value of the independent variable [H_2O_2]

x_3 : coded value of the independent variable [Fe^{2+}]

THANK YOU FOR YOUR ATTENTION