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INFLUENCES OF SEVERAL FACTORS ON THE PHOTOLYSIS OF EPIRUBICIN

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Introduction

Epirubicin is the 4'-epimer of doxorubicin and is a member of the anthracycline class of antibiotics. Epirubicin produces less side effects than doxorubicin and so it can be used in higher doses. This has been used in the treatment of breast, gastric, ovarian, colorectal carcinomas. Prior studies have shown that stability of drug may be influenced by environmental factors relative to air humidity. The stability of epirubicin is important to be investigated both in solutions and in solid phase.

Materials and methods

The irradiation experiments were carried out in a photoreactor, using a low pressure Hg vapour lamp. The distance of the UV lamp from the surface of the sample was maintained at 75 mm. The lamp emits predominantly UV radiation of the wavelength of 254 nm. The total incident photon flow was $1.92 \times 10^{-6} \text{ E}^{-1}$, as determined by ferrioxalate actinometry.

The epirubicin concentration was determined spectroscopically from 200 to 700 nm using a Jasco V-530 spectrophotometer with a spectrometric quartz cell (1 cm path length). The maximum absorbance wavelength (λ_{max}) of Epirubicin is 483 nm and the pH data were recorded on a Radiometer Copenhagen pH-meter (Denmark).

To investigate the influence of solvents on the photolysis of epirubicin, several pure organic solvents (methanol, ethanol, n-propanol, isobutanol and acetonitrile) were used.

Results and conclusions

In our study, the effects of several factors: light, pH values, solvents and temperature on degradation of epirubicin were investigated. Photodegradation of this pollutant followed first-order kinetics.

In order to study the influence of the initial pH on photolytic degradation rate, experiments were performed in the pH range 2 ÷ 10, using a sample with $1 \times 10^{-5} \text{ M}$ pollutant content at irradiation time between 5 ÷ 20 min. Pollutant degradation efficiency increases from 61 % (20 min irradiation) to 100% (10 min irradiation) with pH increases from 2 to 10.

Solvents and presence of oxygen may have considerable influence on the photodegradation of pollutant in liquid media. It was observed that, the degradation mechanism and kinetic parameters are influenced by the polarity of the solvent. The photolysis rate constants were calculated by the plot of $\ln(A_0/A)$ versus irradiation time, and the results for methanol solution are presented in Figure 1.

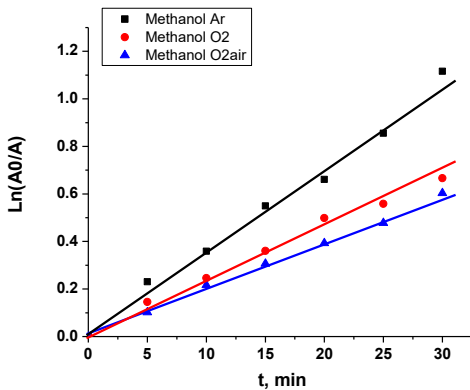


Figure 1. The influence of oxygen on the rate constant in the methanol solution in ($[Epi] = 1 \times 10^{-5} \text{ M}$, Ar, O₂)

Figure 2 shows the influence of temperature (25 and 50°C) on the photochemical degradation process. The rate constant increased with the increasing of temperature.

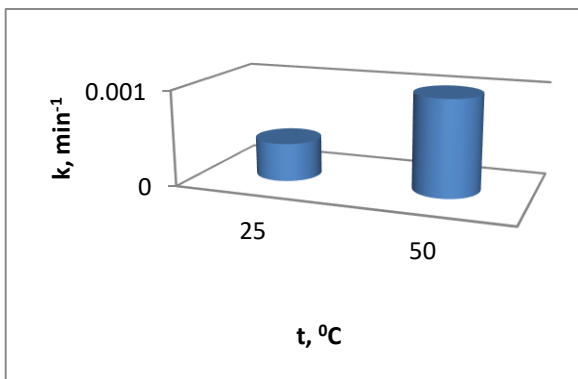


Figure 2. Influence of temperature on the rate constant.