Study the efficiency of thermal conversion of some organic dyes in aqueous solutions

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Abstract

A study has been preformed to investigate the photoconversion of eosin B , brilliant yellow and thymol blue dyes in aqueous solution by exposing the dye solution to solar radiation at a limited period of time. The efficiency was invistigated by measuring the difference between maximum temperature of dye solution and reference (water). The work involves the studying of the effect of dye concentration , time of exposure and presence of EDTA as electronic donor . It has been found that the efficiency was partially depending on the cocentration of dye , while the conc . was decreasing throuh the time of exposure . When the EDTA was added, on clear positive effect was found except the brilliant yellow and thymal blue with concentration of $1x10^{-1}$ M. The optimum concentration of most states was $1x10^{-3}$ M.

Introduction

The use of organic dyes in the photoconversion of sun light witnessed huge expansion throuh the last two decades . This process needed essential requirements such high solubility of dye in low cost solvents, high absobance of wide range of visible spectrum , stability of dye toward light and heat and availability of dye.

The liquid solar collector system(LSCS) has been designed and tested in previous studies[1-3] .The method of these studies concentrated on using the dye in mixture or individual state. The efficiency of LSCS has been measured using figure of merit (FM) which is defined as[1]:

$$F.M=\frac{\Delta T_{MAX}}{\bar{I}.t_{\Delta TMAX}}$$

Where ΔT_{MAX} is the difference between maximum temperature of dye solution and temperature of reference solution, $T_{\Delta TMAX}$ the required time of arrival ΔT_{MAX}, $\bar{I}$ is the average of intensity of sun light in this period of time. The scope of present work deals with testing the thermal performance of eosin B, brilliant yellow and thymol blue dyes. The work around about the studying of effect of dyes concentration and effect of EDTA which is mentioned in literature as donor of electrons[4-7]. EDTA has a virtue of reduction of oxidized form of dye molecules in solution.