



# **AGGREGATION OF TWO DISAZO DIRECT DYES. EXPERIMENTAL AND THEORETICAL STUDY**

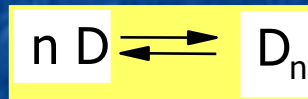
**Simona Gabriela Muntean,<sup>1</sup> Maria Grad,<sup>1</sup> Z. Szabadai <sup>2</sup>**

*<sup>1</sup>Institute of Chemistry Timisoara of Romanian Academy,  
B-dul Mihai Viteazul 24, 300223 Timisoara, Romania;*

*<sup>2</sup>University of Medicine and Pharmacy "Victor Babes", Faculty of Pharmacy Piata E.  
Murgu 2-4, 300034 Timisoara, Romania*

# Introduction

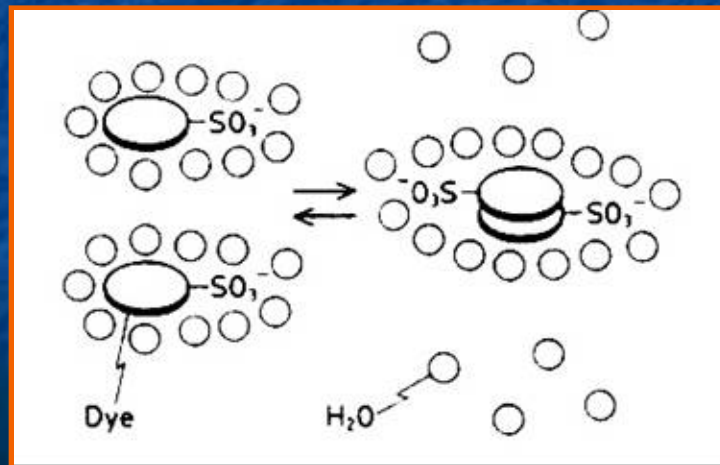
- Adsorption of dyes on solid adsorbents is influenced by the physicochemical properties of the dyes solutions.
- Azo dyes are compounds whose molecules have a tendency to self-associate in the ground electronic state. That can lead to the formation of dimers, trimers, and tetramers.



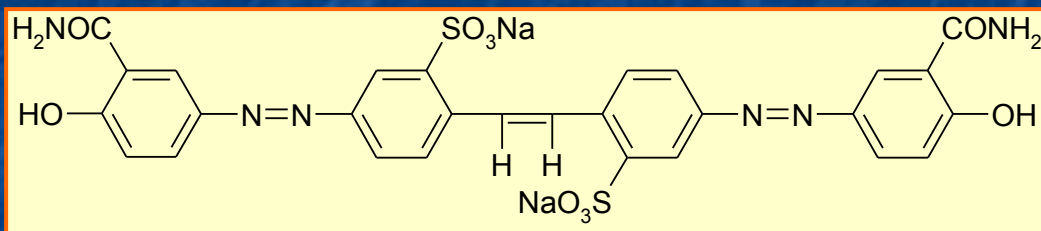
- The main factors influencing aggregation are: dye structure, dye concentration, electrolyte concentration, and temperature.

# Aim

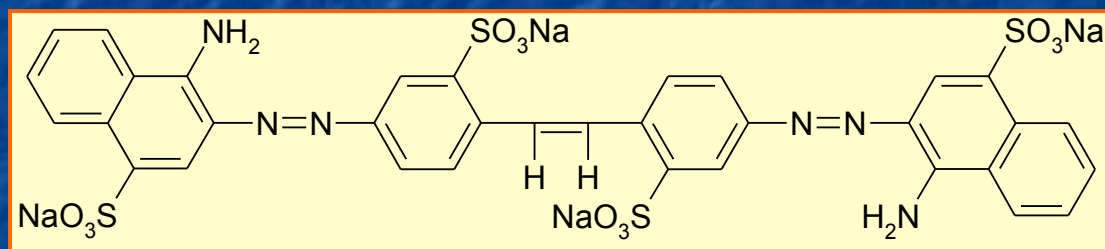
- Investigation of the molecular aggregation of two direct dyes in aqueous solution, as a function of dye concentration.
- Mathematical analysis of the aggregation of the studied dyes.



# Experimental



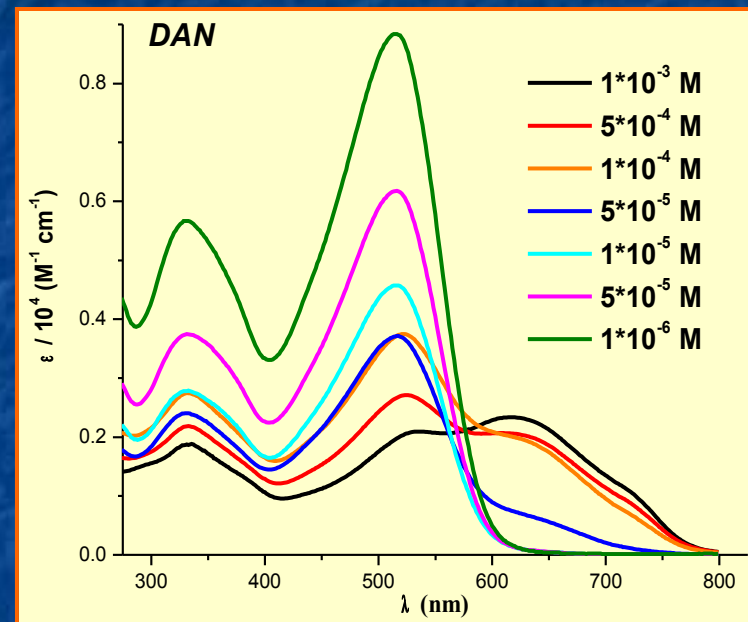
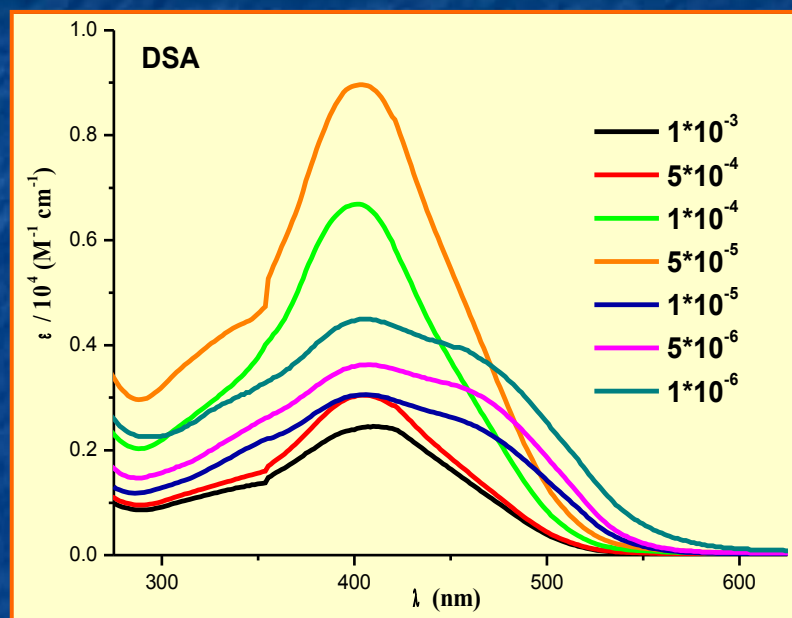
**DSA**



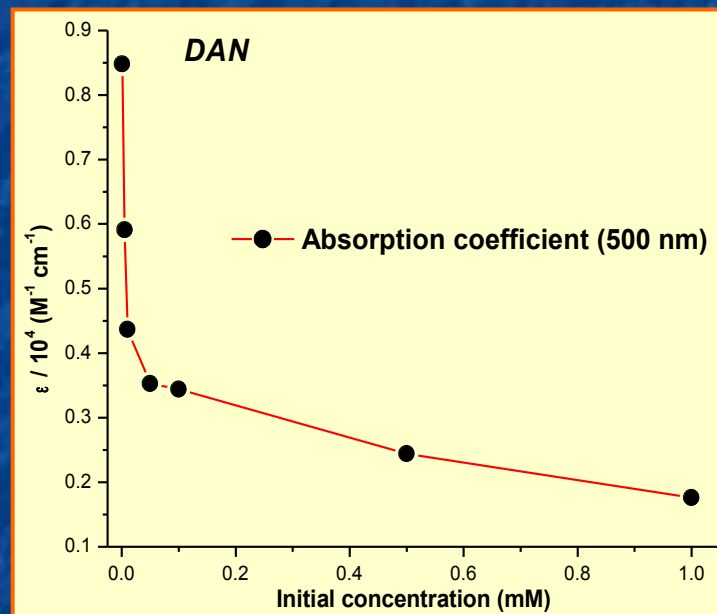
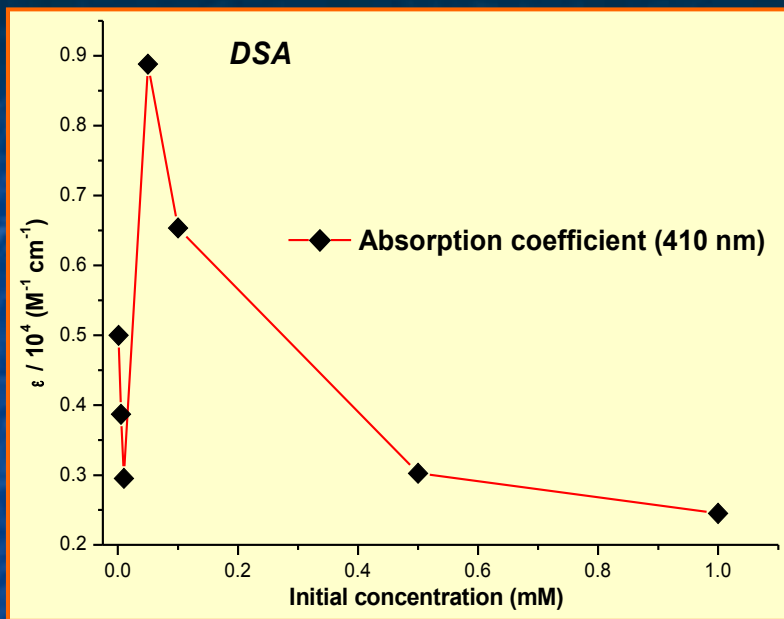
**DAN**

**Fig. 1. The structure of the studied disazo dyes**

# Results and Discussions



**Fig. 2. Direct dyes DSA and DAN absorption spectra at different concentrations**



**Figure 3. The trend in studied dye's absorption coefficient as concentration varies**

# Mathematical analysis

- Using the experimental absorbance values, an  $n \times m$  ( $n$ : values of absorption at different wavelength,  $m$ : concentrations) dimension matrix was build for a series of analytical concentrations.
- The number of eigenvalues of this matrix different from zero (within accepted experimental errors) is equal to the number of chemical species (monomer, dimer, etc.) presented in the system.

# Matriceal Analysis

The eigenvalues value of the absorption matrix for **DSA** and **DAN** dyes

<b>DSA</b>	<b>DAN</b>
$-3.084 \times 10^{-15}$	$-3.983 \times 10^{-15}$
$3.985 \times 10^{-14}$	$2.371 \times 10^{-5}$
$1.399 \times 10^{-13}$	$1.938 \times 10^{-4}$
$1.566 \times 10^{-4}$	$3.783 \times 10^{-4}$
$1.001 \times 10^{-3}$	<b><math>2.584 \times 10^{-3}</math></b>
<b>0.087</b>	<b>0.025</b>
<b>3.289</b>	<b>8.339</b>
<b>163.642</b>	<b>116.417</b>



# Conclusion

- **UV-Vis spectroscopy has been used to study the aggregation of two disazo direct dyes (DSA, DAN) in aqueous solution;**
- **The dyes aggregation depends on the concentration.**
- **From the matriceal analysis, the number of chemical species presented in the system was determined, in domain of concentrations studied.**

