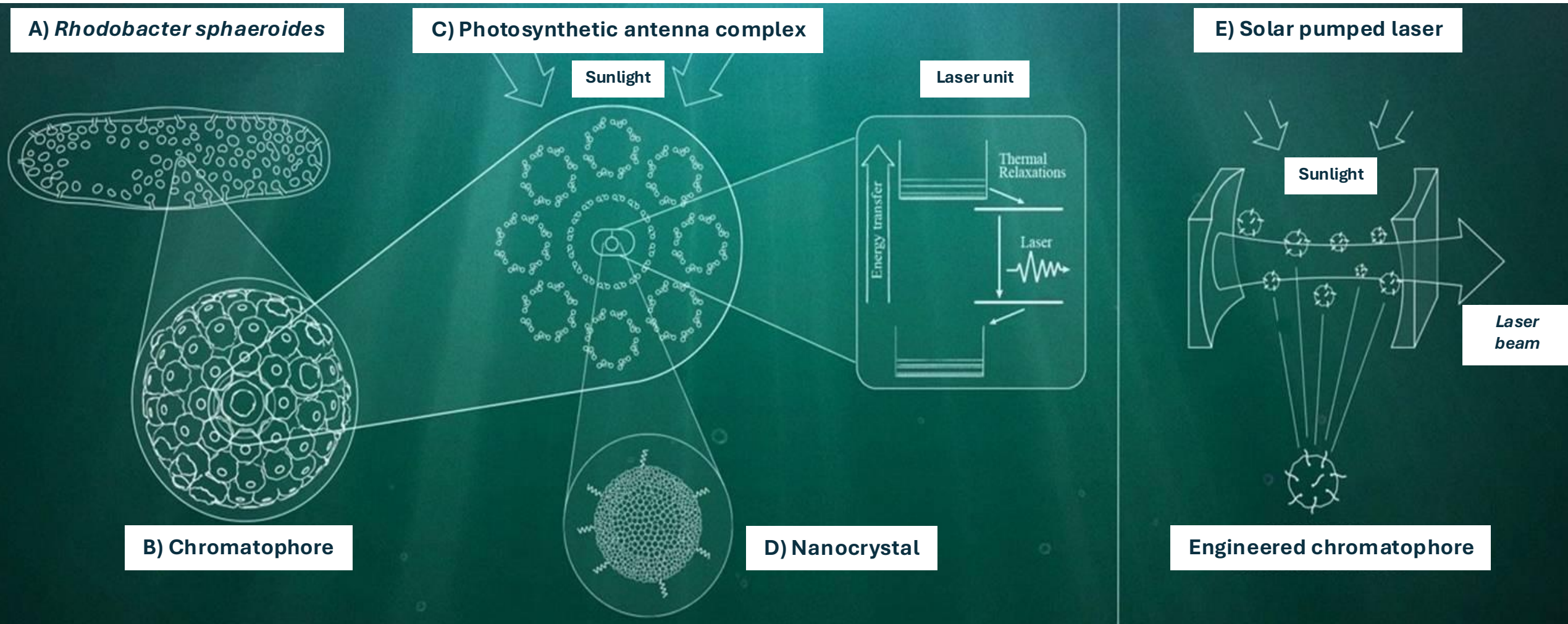




# Biocompatibility of non-aqueous solvents with *Rhodobacter sphaeroides* chromatophores

Claudia Zonno

# Towards a bio-mimetic sunlight pumped laser based on photosynthetic antenna complexes



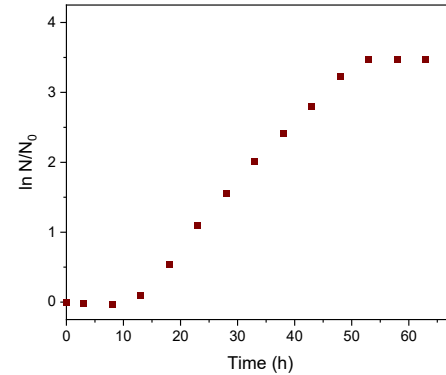
# *Rhodobacter sphaeroides*

## 1. Bacterial growth of the wild type (2.4.1) and mutant (R26) strain

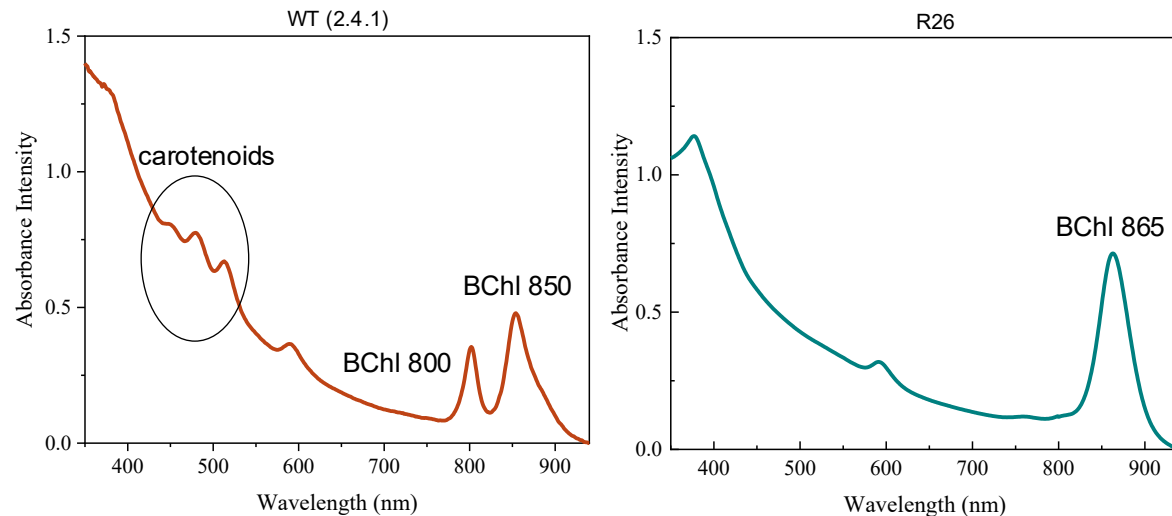
T=28 °C, Halogen Lamp 80 W, loosely anoxic conditions



Growth curve of *Rh. sphaeroides*

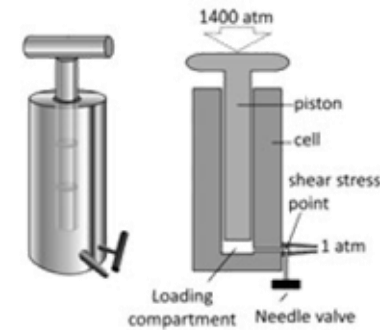


Absorption spectra of *Rh. sphaeroides*

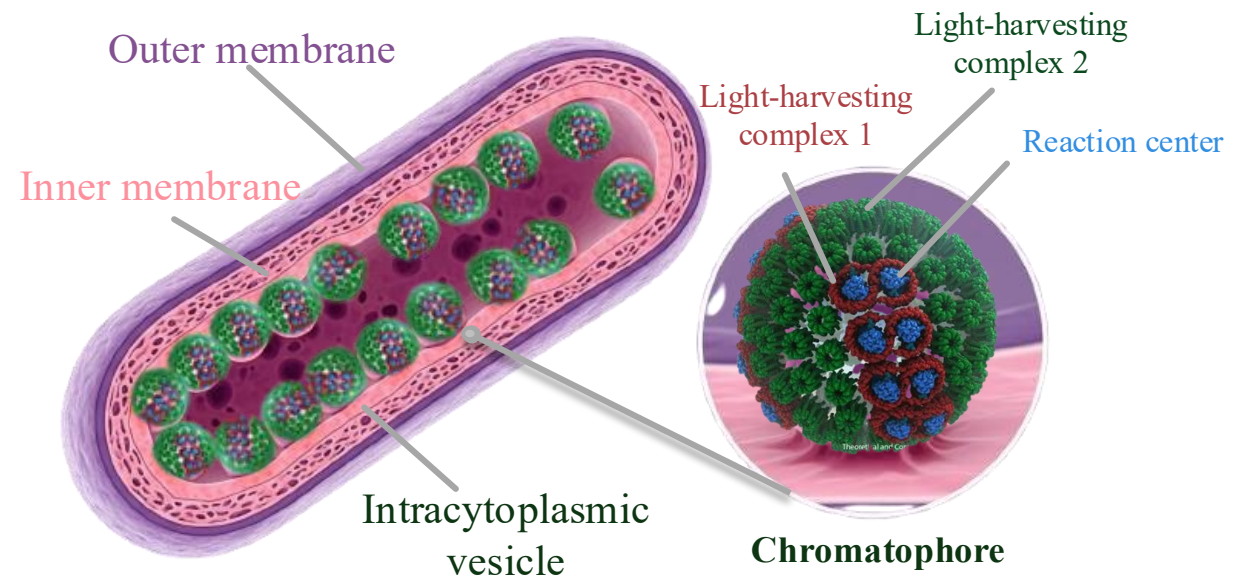


## 2. Isolation of fully functional chromatophores

via French Press



Sonication-based



# Aim of this work



combination between **lasing unit** (dye or nanocrystal) and **chromatophores**



**common solvent medium**

**Organic Solvents**

**Polarity**

VS

**Deep Eutectic Solvents**

**Hydrogen-bonding strenght**

# Effects of organic solvents on R26 chromatophores



## Polarity

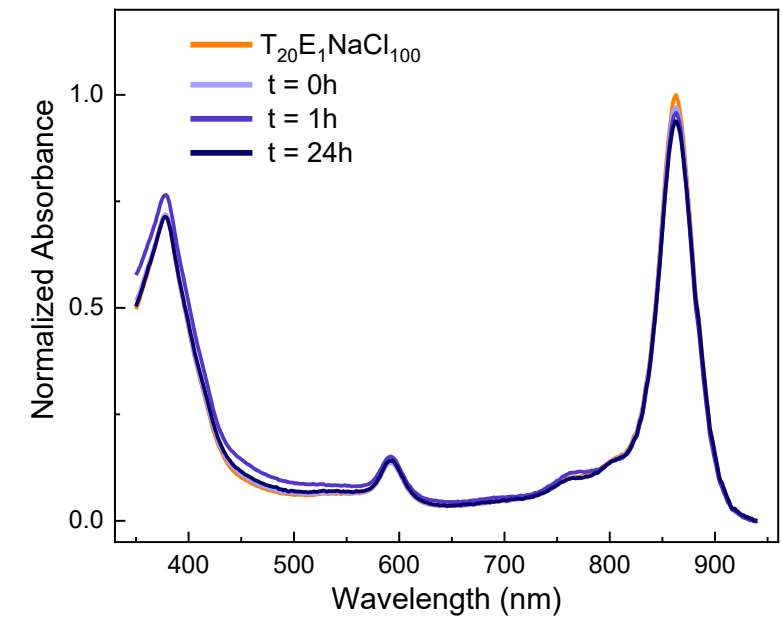
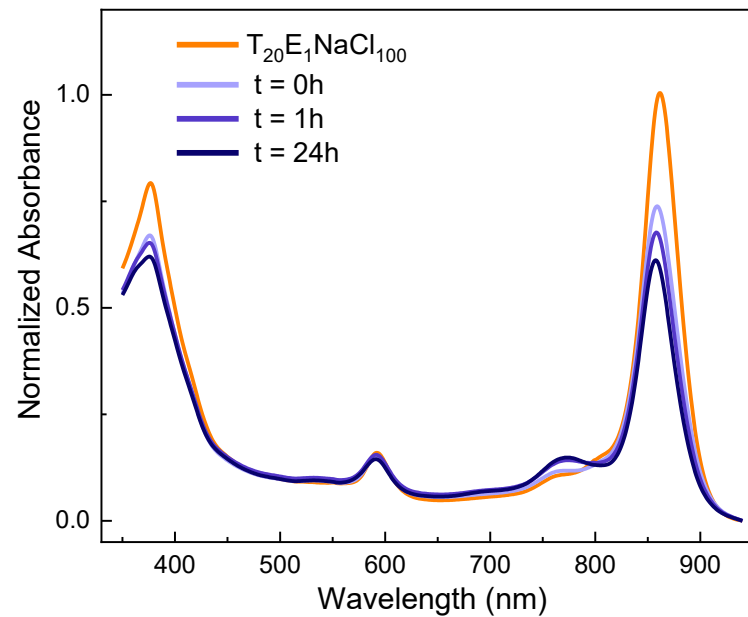
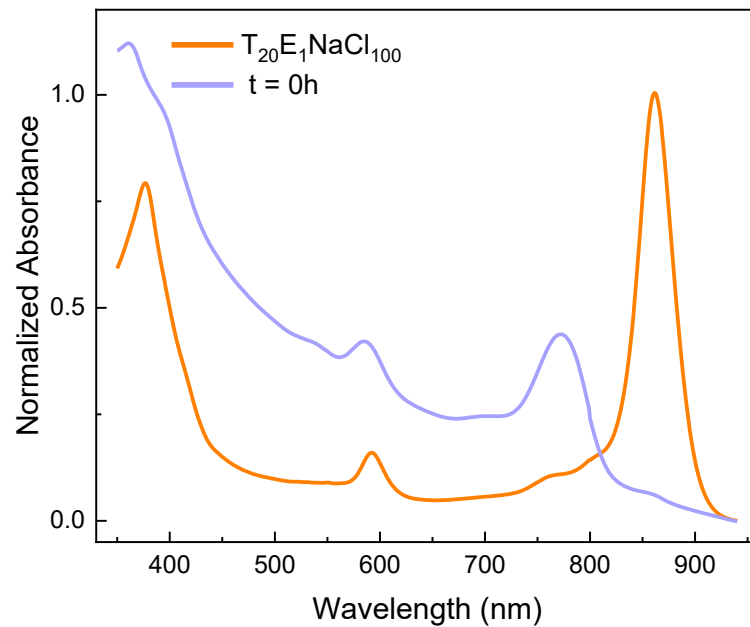
chloroform (10% v/v)



acetone (10% v/v)



DMSO (10% v/v)

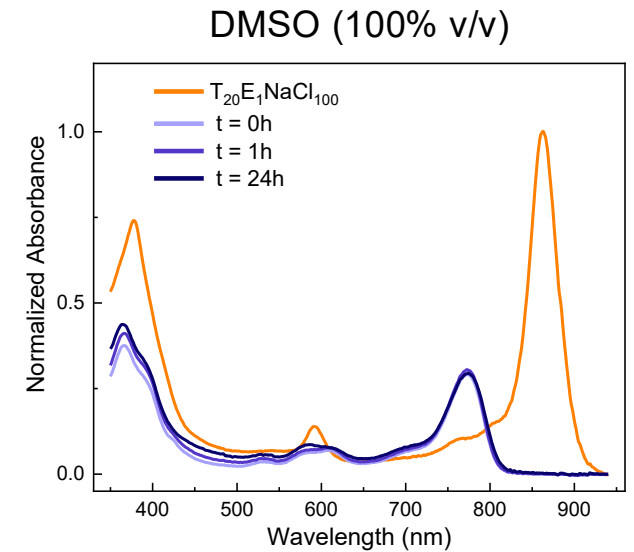
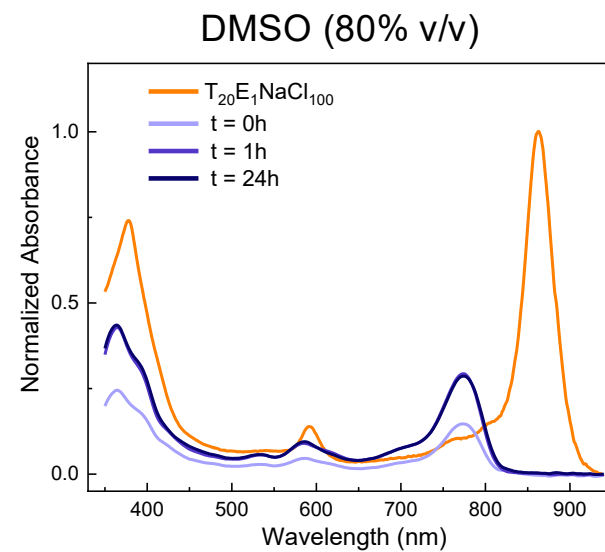
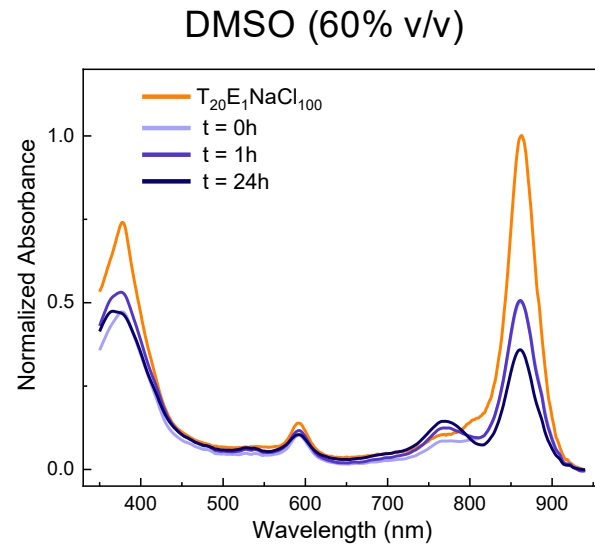
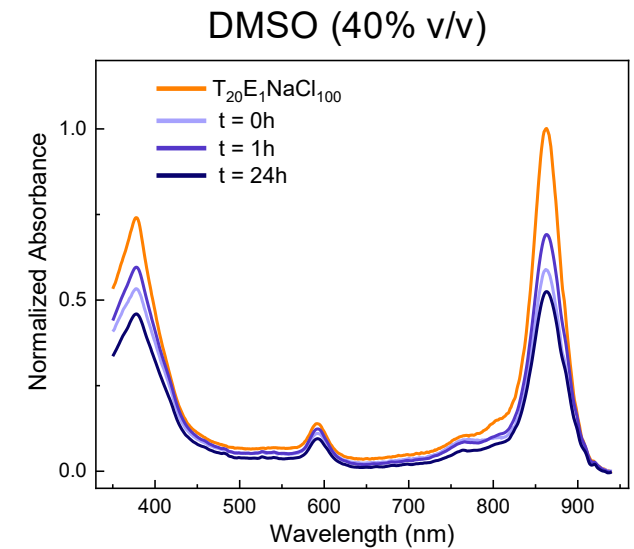
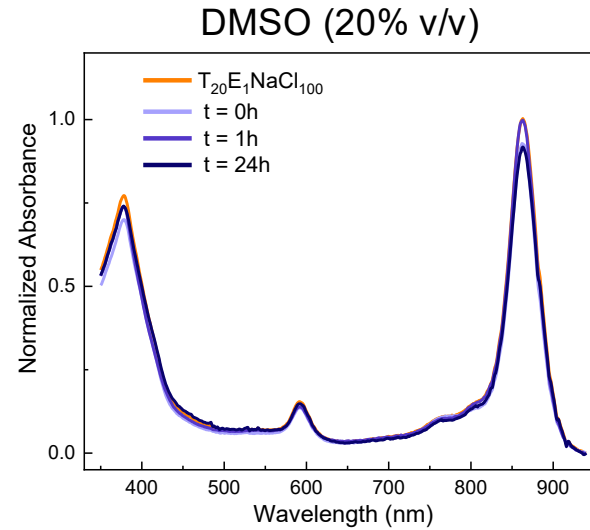
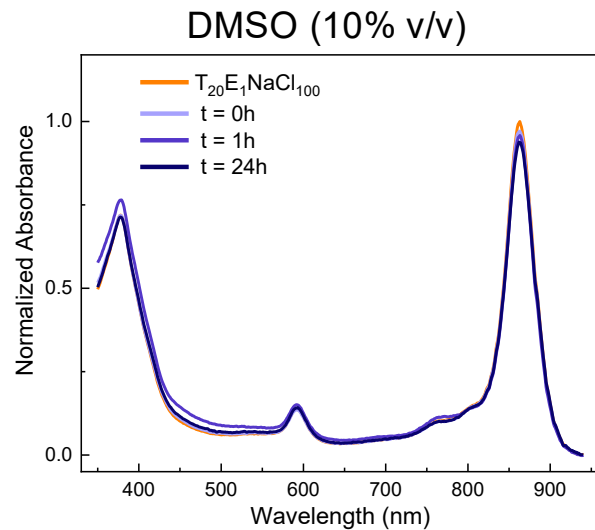


Dimethylsulfoxide (DMSO)

$T_{20}E_1NaCl_{100}$ : chromatophores buffer solution used as control



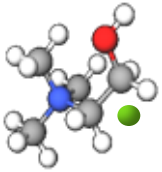
# Effects of DMSO on R26 chromatophores



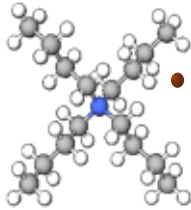
$T_{20}E_1NaCl_{100}$ : chromatophores buffer solution used as control

# Deep Eutectic Solvents (DESs)

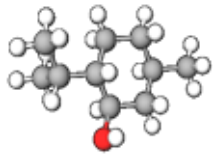
## HYDROGEN BOND ACCEPTORS



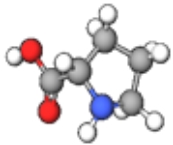
Choline chloride



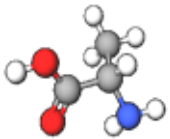
Tetrabutylammonium bromide



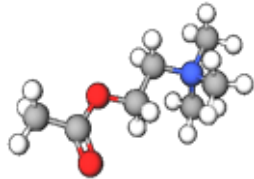
Menthol



Proline



Alanine

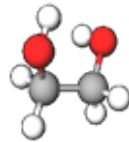


Choline acetate

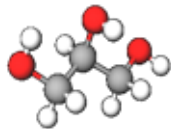
## HYDROGEN BOND DONORS



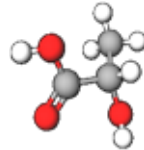
Urea



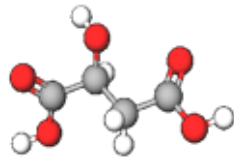
Ethylene Glycol



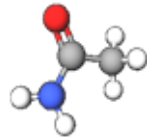
Glycerol



Lactic acid



Malic acid



Acetamide

## Biocompatible Solvents

- ❖ From renewable sources
- ❖ Non-volatility and non-flammability
- ❖ Non-toxicity to human and environment
- ❖ Easily preparable and low-cost



# Effects of DESs on R26 chromatophores



## Hydrogen-bonding strenght

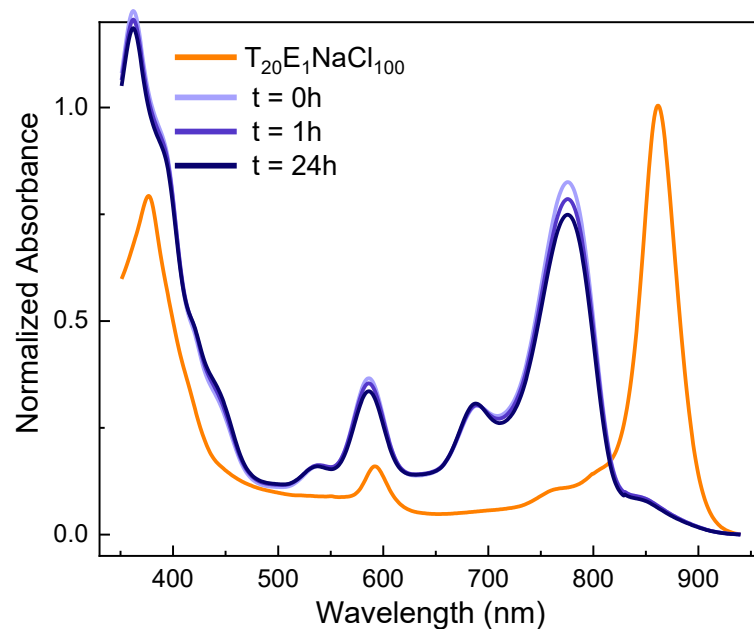
TBAB:Gly 1:3 (mol/mol)



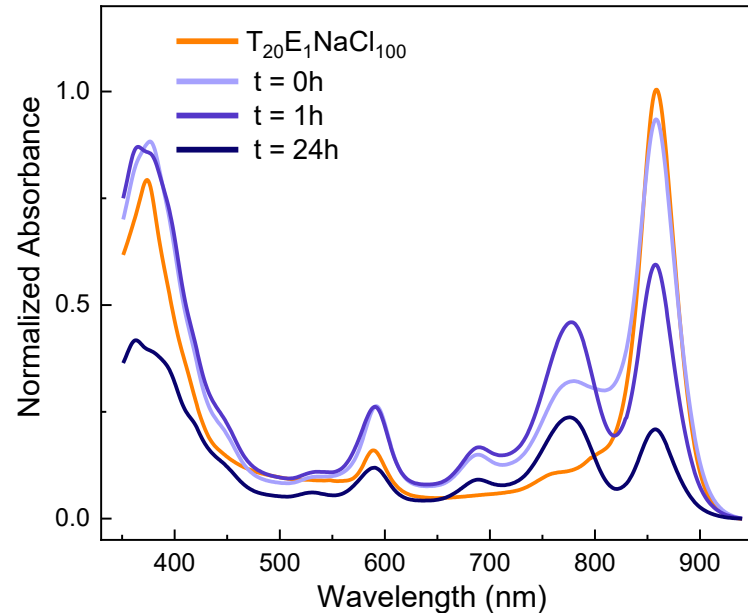
ChCl:EG 1:3 (mol/mol)



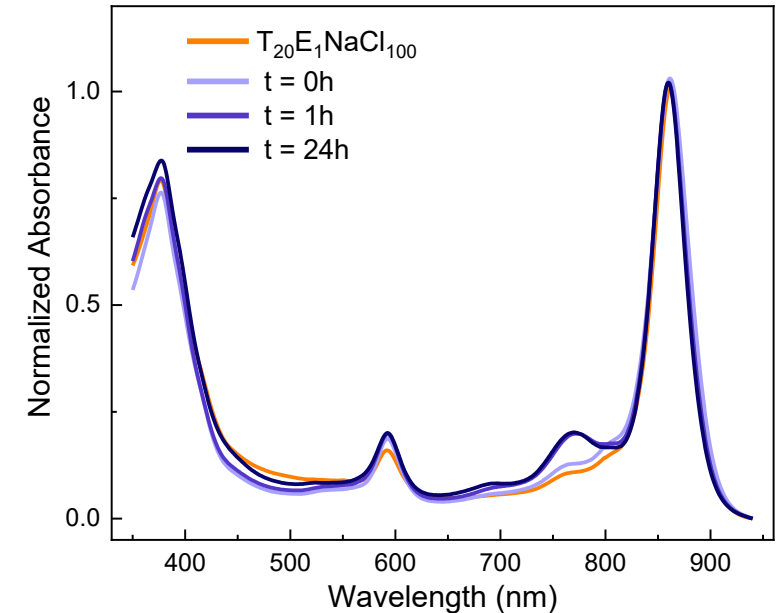
ChCl:U 1:2 (mol/mol)



Tetrabutylammonium bromide (TBAB)  
Glycerol (Gly)



Choline chloride (ChCl)  
Ethylene glycol (EG)

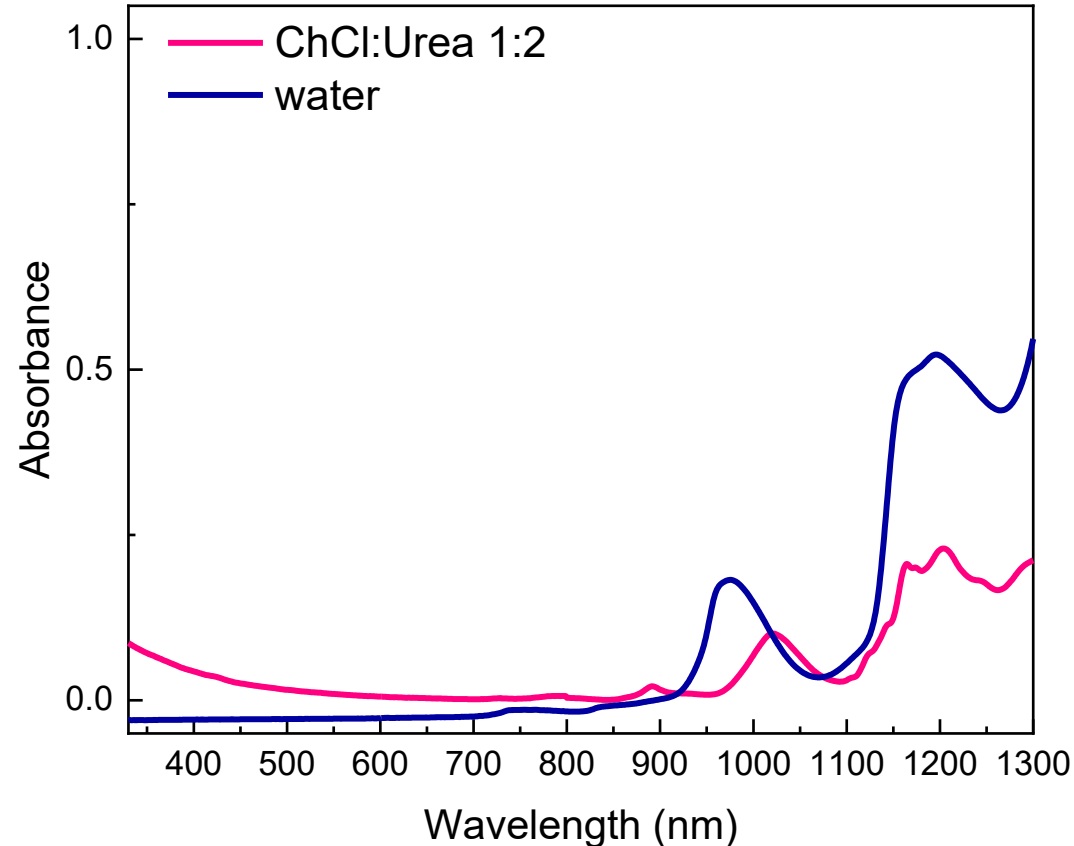


Choline chloride (ChCl)  
Urea (U)

$T_{20}E_1NaCl_{100}$ : chromatophores buffer solution used as control



# NIR-region: water vs ChCl:U



- ❖ Water dominate the NIR spectrum
- ❖ In ChCl:U peaks are smaller
- ❖ This comparison can be used to quantify water content in DES and monitore the hydration state

# Conclusions and future perspectives



## Conclusion

### Organic Solvents

- ❖ Chloroform
- ❖ Acetone
- ❖ **DMSO**

### DESs

- ❖ TBAB:Gly 1:3 (mol/mol)
- ❖ ChCl:EG 1:3 (mol/mol)
- ❖ **ChCl:U 1:2 (mol/mol)**

## Future perspective

- ❖ Photocycle efficiency and photosynthetic characterization in DESs
- ❖ Emission investigation of photosynthetic entities in DESs
- ❖ Interaction of DES with the lasing microgravity

# Team and acknowledgement



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Dott.ssa Rossella Labarile



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## Thank you for your attention

