Photo chemical speed dating

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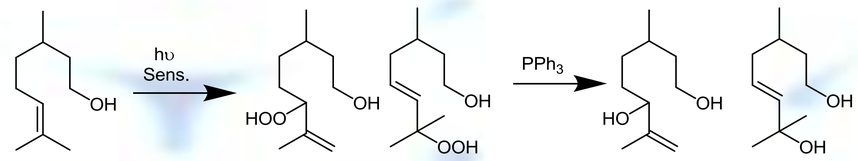
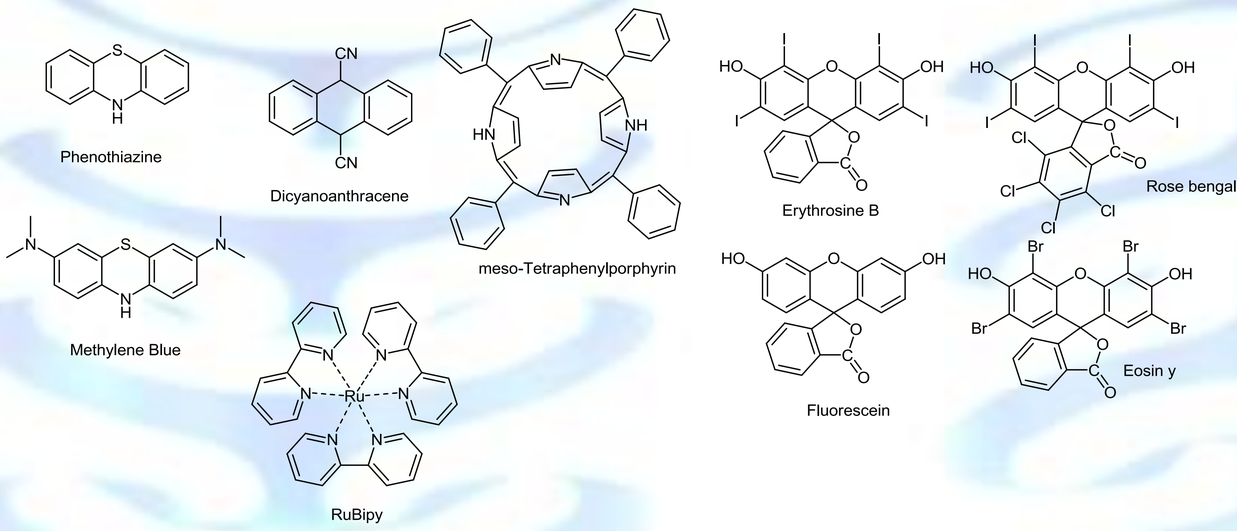
Classical batch photochemistry is characterized by a light source – normally mercury based – dipped into a reaction vessel. This setup requires filters and/or a set of different light sources to do a screening: for example finding the ideal wavelength, or as in this study the ideal pair of wavelength and photosensitizer.

The Corning® Advanced-Flow™ Lab Reactor with the Lab Photo Reactor add-on allows screening with just two sets of LED panels containing multiple wavelengths.

Oxidation of Citronellol

In this study 9 photosensitizers from 5 different families were tested with 10+1 wavelengths in order to identify efficient pairs as candidates for the oxidation of citronellol.





Reaction Conditions

Concentration: 0.5 N Citronellol in either MeOH or CH_2Cl_2

Photosensitizer: 1mol% (*RuBipy 0.1mol%)

Flow rate liquid = 1 ml/min = 0.5 mmol/min

Flow rate Oxygen = 14 Nml (1.75 ml/min @8bar) ~0.6 mmol/min

Pressure (reactor outlet) = 8 bar

Quench: 0.5N PPh_3 in CH_2Cl_2

Wavelength (λ max of LED):
365, 375, 383, 396,
407, 422, 443, 467,
524,
624,
4000K

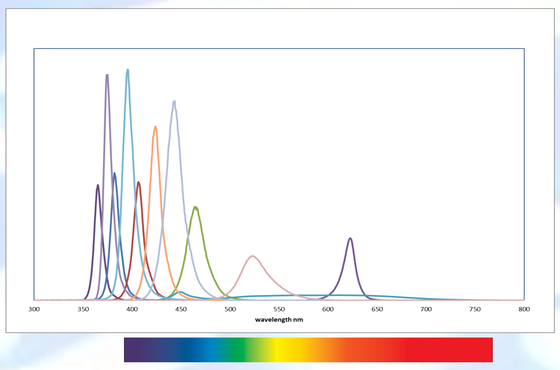
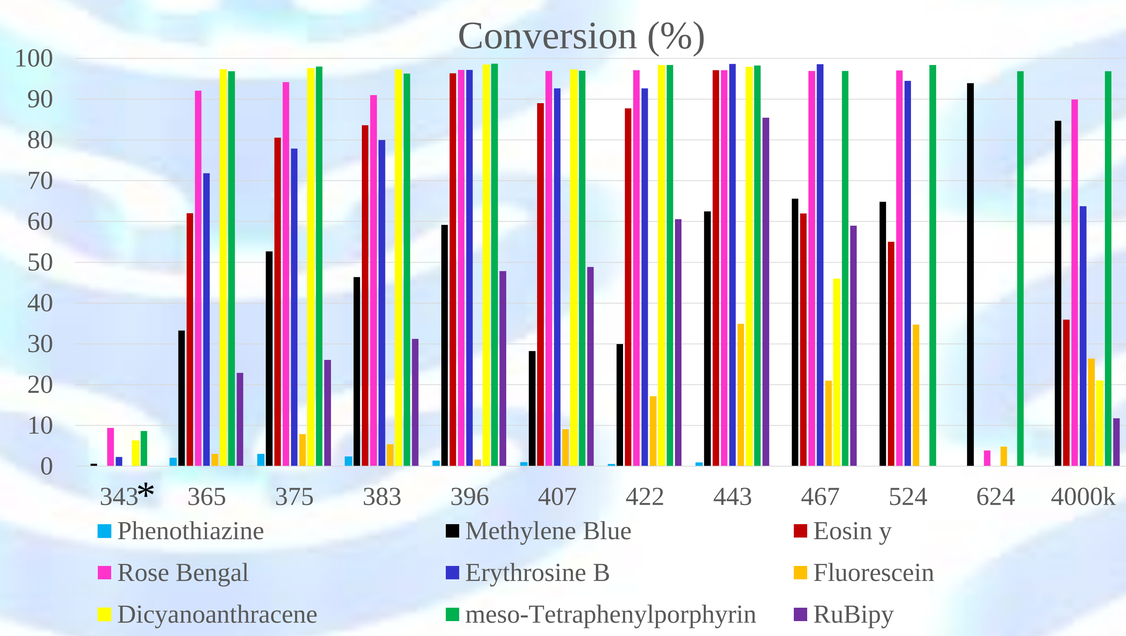
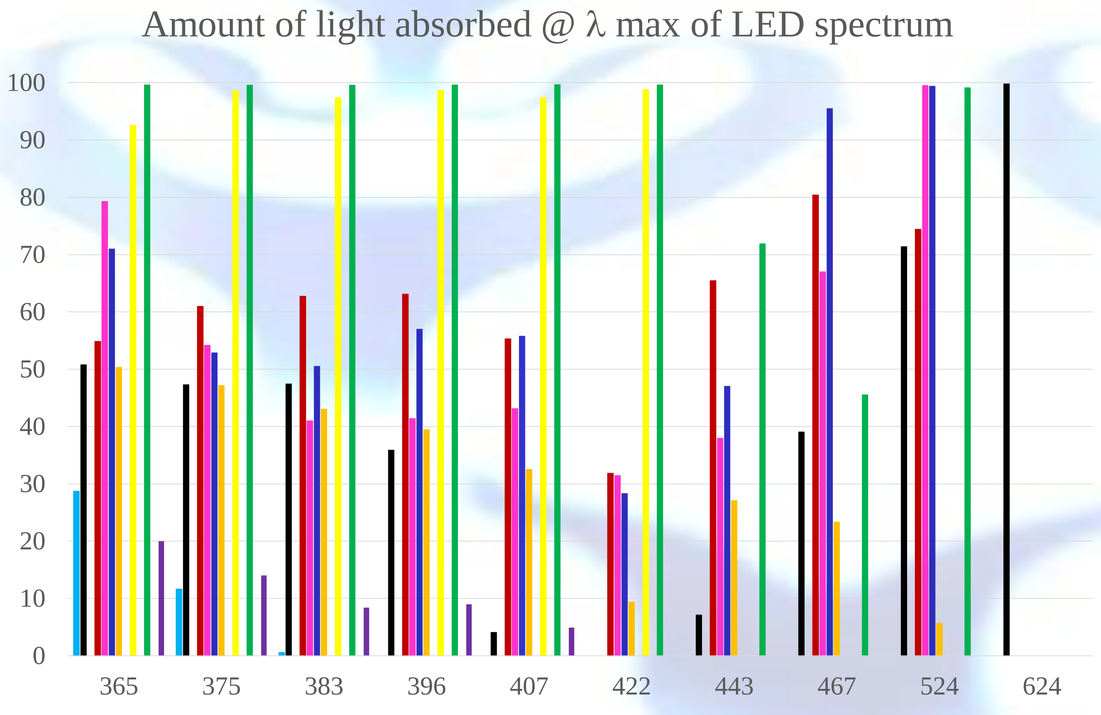


Photo Chemical Speed Dating



* For screening purposes only, due to much lower light intensity

Use of Light



Pathlength 0.5 mm, Solution measured as used in the reactor

Summary

In less than two days, 9 photosensitizers were screened using 10 wavelengths and white light.

The results allow identification of the right wavelength for the photosensitizer in this particular system (citronellol, solvent)

The next step would be to optimize the system with the selected photo sensitizer.

Taking for example tetraphenylporphyrine – a rather expensive photosensitizer – the results show high conversion at various wavelengths; furthermore the use of light is perfect. In this case the next step would be to reduce the amount of sensitizer until the transmission is about 1% at λ max in order to see how much sensitizer is really needed.