

# Study of the electrodeless discharge lamps for photochemical applications and temperature dependence of photostationary state in *cis-trans* photoisomerization of stilbene derivatives



Stanislav Relich, Vladimír Církva, Hana Žabová

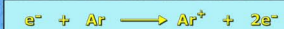
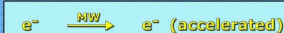


Institute of Chemical Process Fundamentals AS CR, Environmental Process Engineering Laboratory, Rozvojová 135, 165 02 Prague 6, Czech Republic

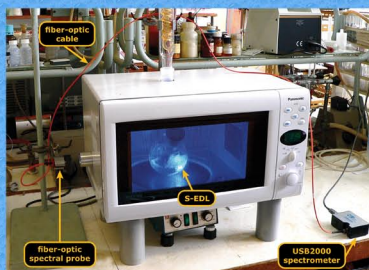
## Electrodeless Discharge Lamps (EDLs)



The principle of Hg-EDL operation



## Characterization of irradiation setup



EDLs consist of:

Glass envelope (20 x 40 mm)  
Fill Hg (2.5 ml), S (5 mg)  
Argon as filling gas (0.1 - 20 Torr)



EDLs spectra measurements

USB 2000 spectrometer (Ocean Optics)  
Fiber optic spectral probe  
Operating software OOIBase32 (Ocean Optics)  
Calibration standard LS-1-CAL (Ocean Optics)

Microwave-EDL irradiation setup

500 ml three-neck flask  
150 ml n-hexane  
EDL + magnetic stirrer  
0.1M solution of stilbene  
Solutions in benzene  
0.5 ml in NMR cuvette  
Teflon drill stopper  
MW output power 600 W

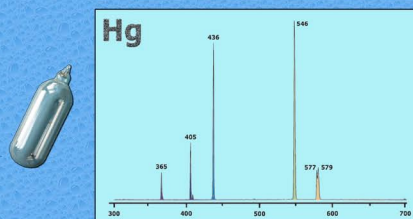
Classical irradiation setup

Thermoregulator (Thermostat U1)  
Thermostated cell  
125 W mercury discharge lamp  
Pyrex filter  
0.1 M solution of stilbene in benzene  
3,5 ml solution in UV/VIS cuvette

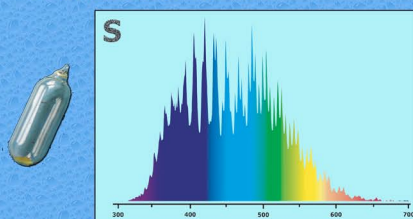


## EDLs Emission Spectra

Hg-EDL and UV/VIS spectrum

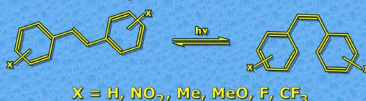


S-EDL and UV/VIS spectrum

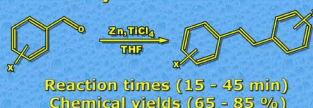


## Results

*Trans-cis* photoisomerization



Preparation symmetric stilbenes by McMurry reaction in MW field



Classical irradiation temperature dependence of photostationary state

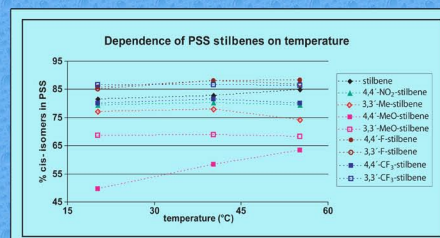


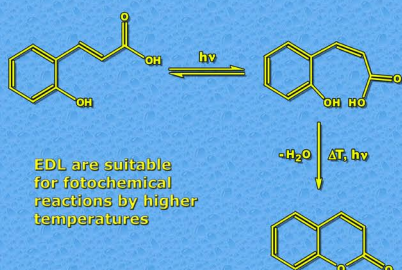
Table for compare classical and EDLs irradiations

source of UV irradiation	temperature	% cis-isomer in PSS									
		stilbene	4,4'-NO <sub>2</sub> -stilbene	3,3'-Me-stilbene	4,4'-MeO-stilbene	3,3'-MeO-stilbene	4,4'-F-stilbene	3,3'-F-stilbene	4,4'-CF <sub>3</sub> -stilbene	3,3'-CF <sub>3</sub> -stilbene	
clas.*	20°C	81	79	76	49	68	85	85	79	86	
clas.*	40°C	82	80	77	58	68	87	87	81	79	
clas.*	55°C	84	79	73	63	68	88	86	86	86	
EDL-Hg	69°C	82	80	85	61	73	87	87	81	79	
EDL-S	69°C	82	81	87	80	86	86	82	77	86	

\* - mercury medium pressure discharge lamp 125 W

EDLs irradiation was carry out at 69°C (bp of hexane)

## Other applications



## Conclusions

- Pyrex-EDL absorbs most of the UV below 290 nm without the necessity of filtering off the undesirable part of radiation
- Methoxy groups in *para*- positions of stilbene (4,4'-MeO) have the effect on PSS at different temperatures
- The contents of *cis*-isomer in PSS is dependent on type of EDLs

## References

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- Home page: <http://home.tptl.cas.cz/cirkva>

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