

Übersicht der UV-Lampen und ihre Einsatzgebiete

Darmstadt, 15. Oktober 2009

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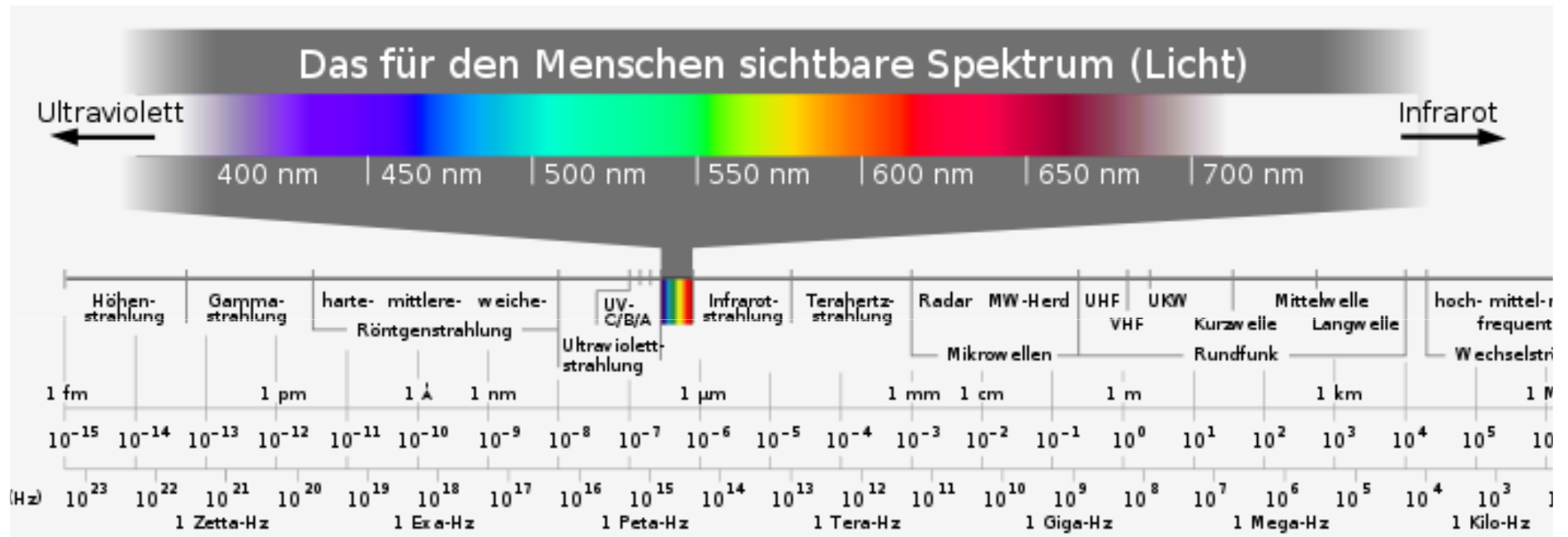
GOAL

- **to give an overview for existing UV-lamps**
- **and their application areas**

OUTLINE

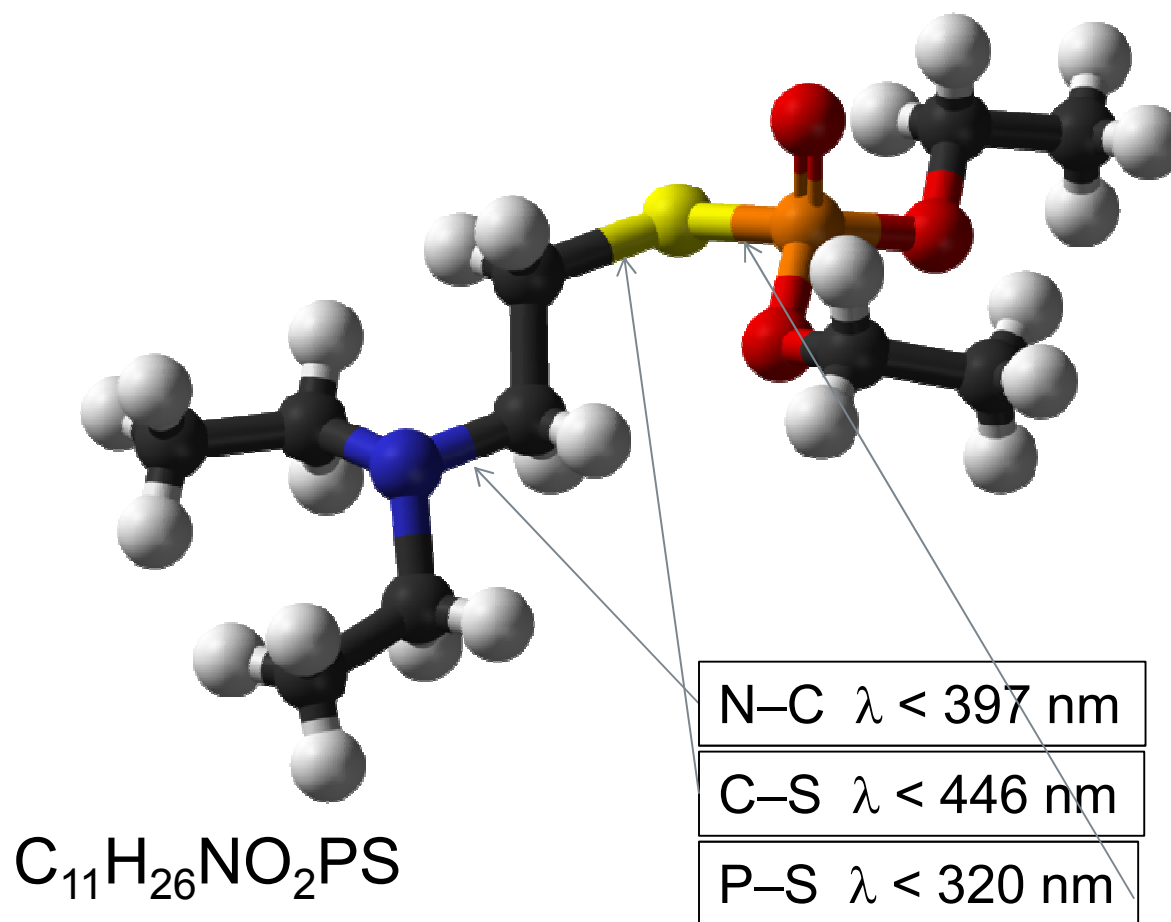
- **UV-Light**
- **UV-Light Sources based on Mercury Vapor Discharge**
- **Mercury free UV-Light Sources**
- **Application Areas**

UV-Light



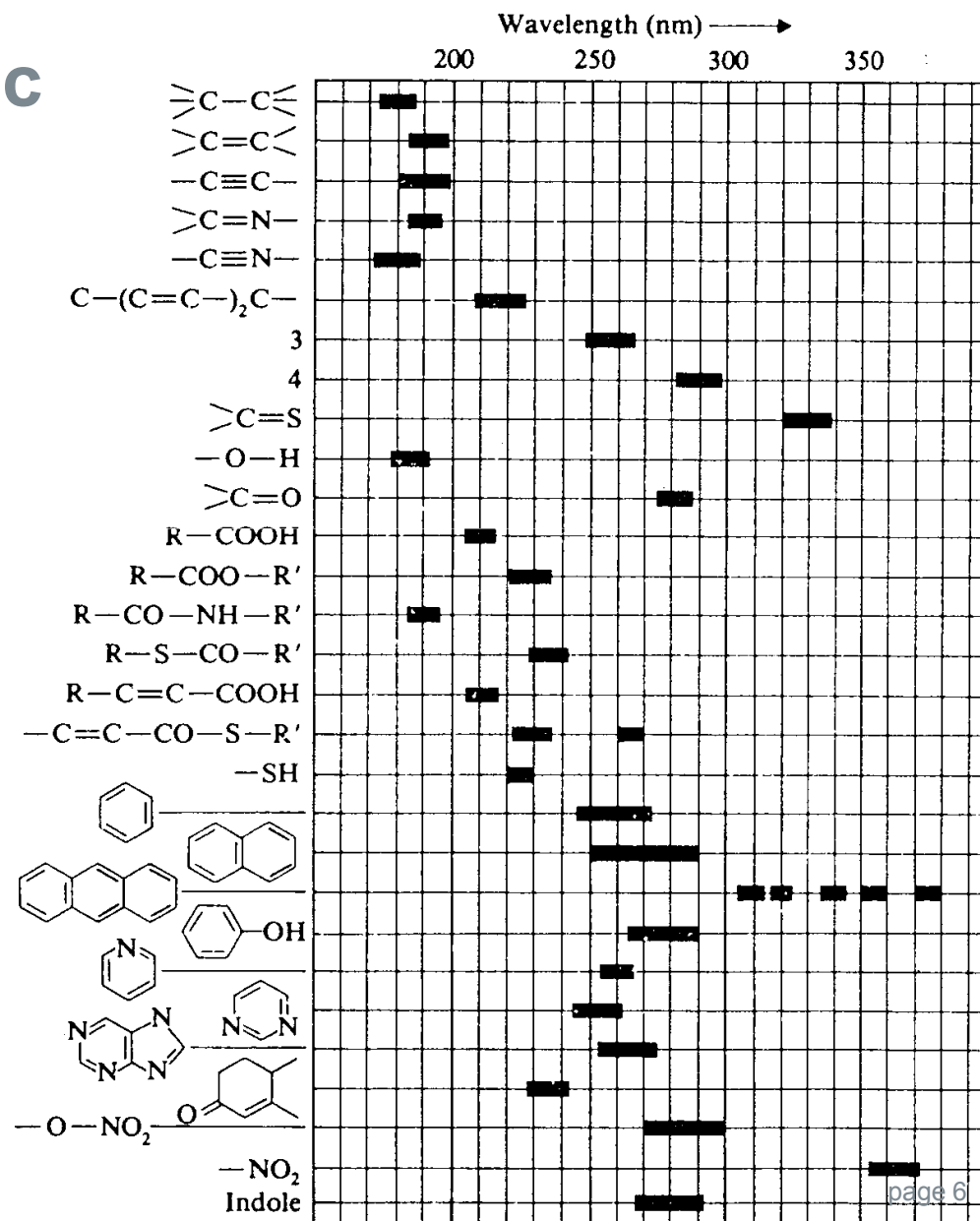
UV-A	315 – 380 nm	3.3 – 4.0 eV
UV-B	280 – 315 nm	4.0 – 4.4 eV
UV-C	200 – 280 nm	4.4 – 6.2 eV
V-UV	100 – 200 nm	6.2 – 12.4 eV

Photolysis of Organic Matter

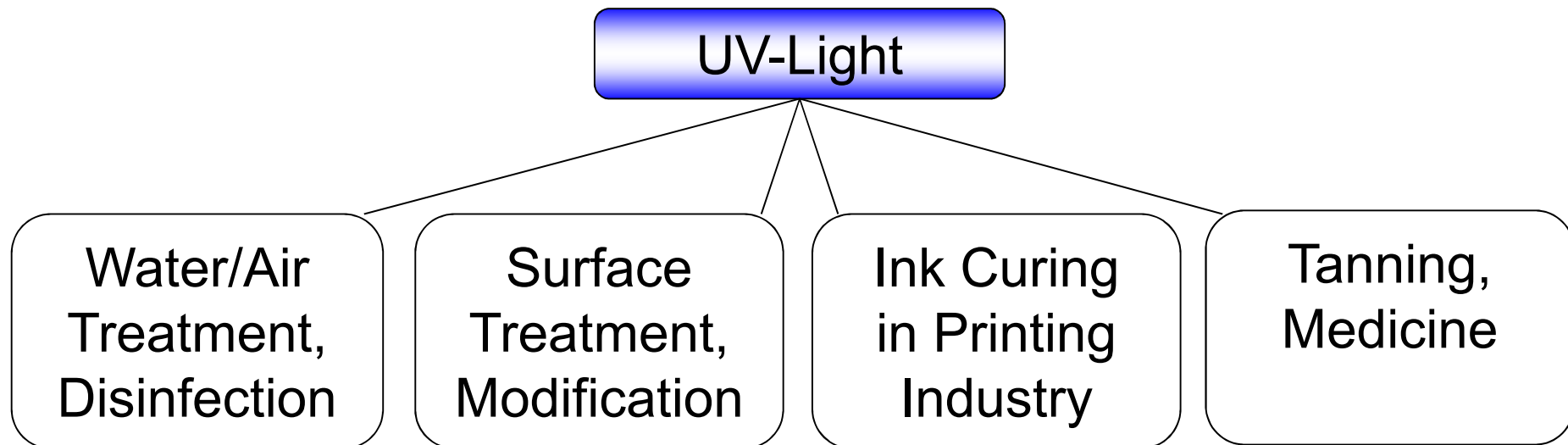


Decomposition Threshold

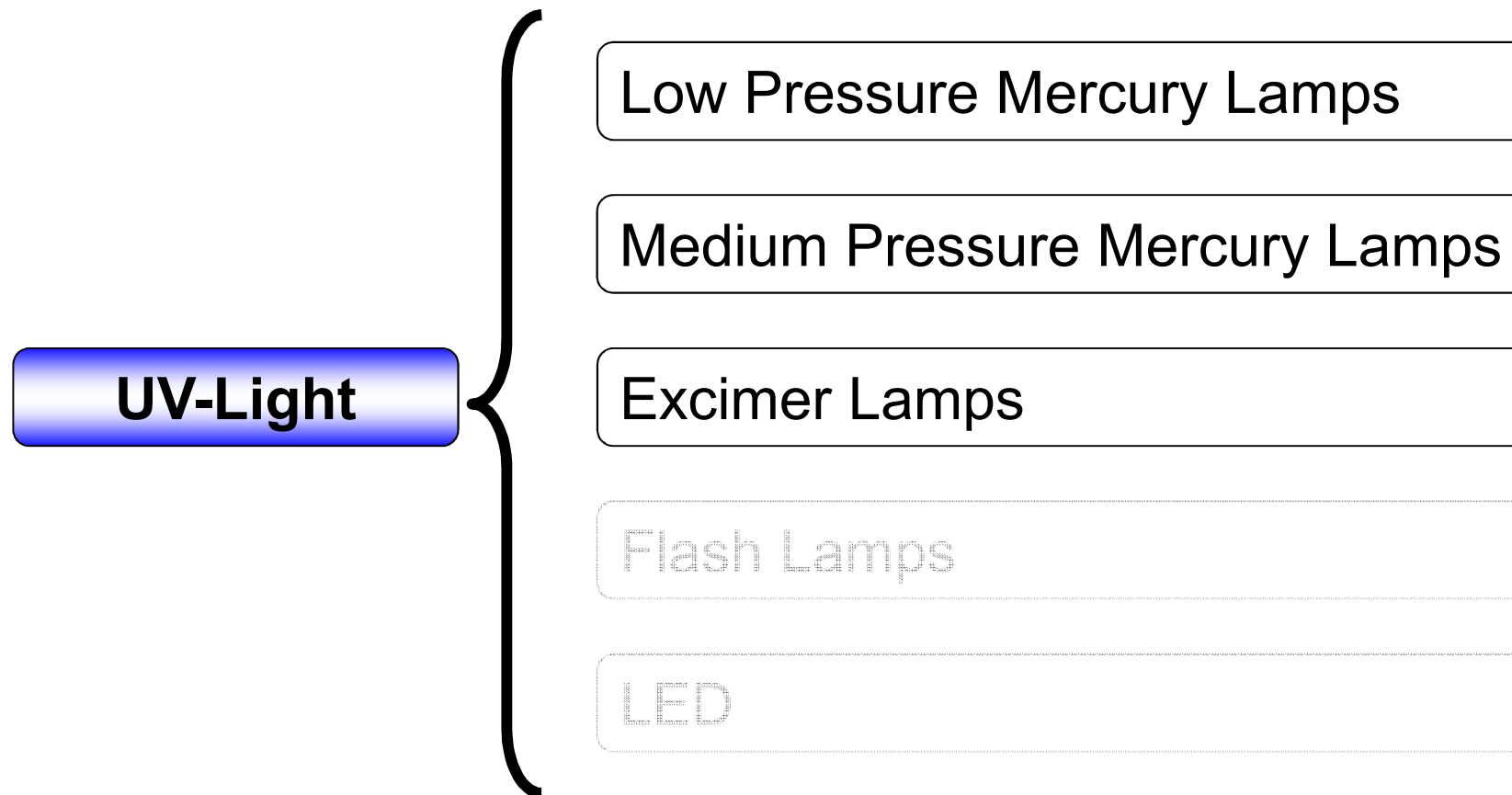
Dissociation of Organic Bonds by UV-Light



Application Fields of UV-Light

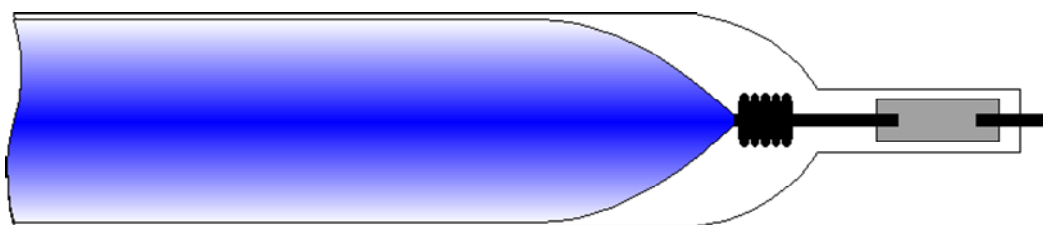


UV-Light Sources

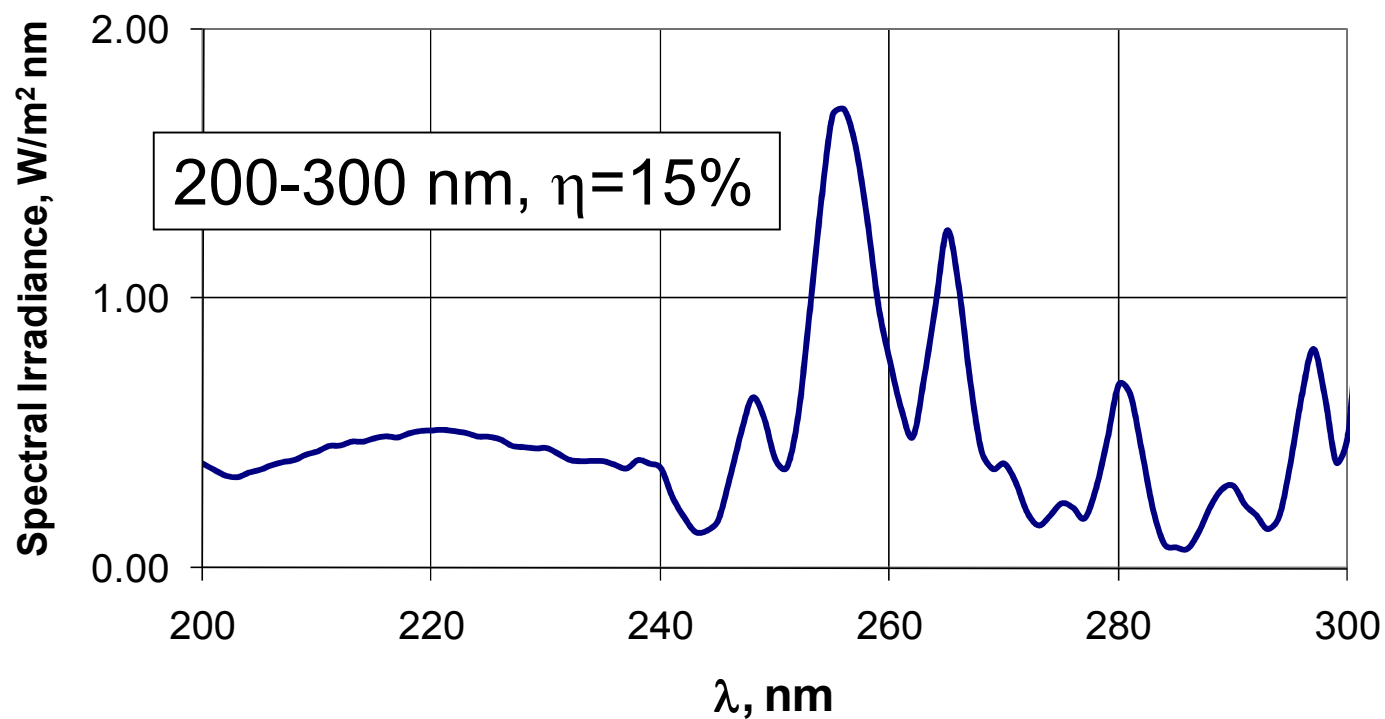


Medium Pressure Lamps

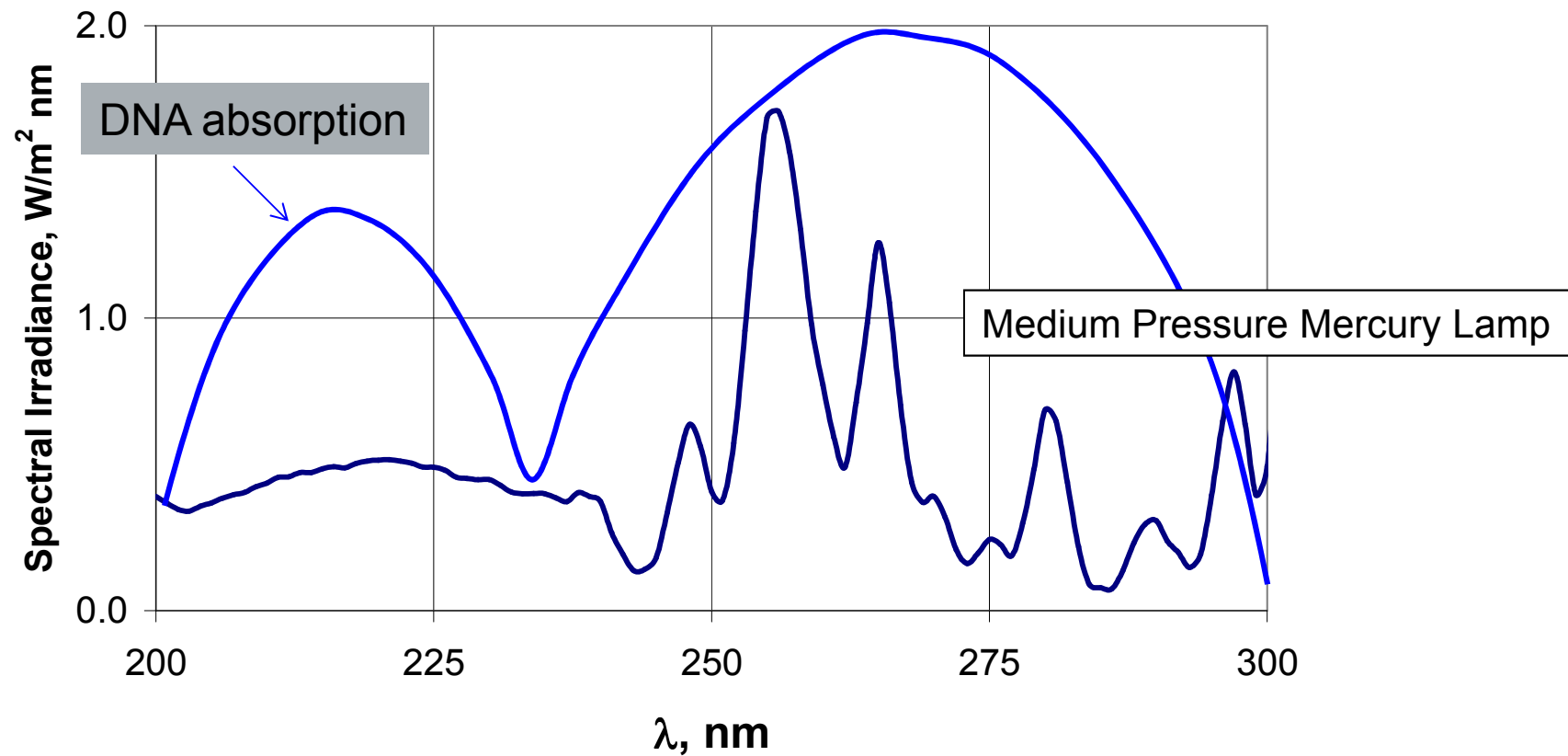
Medium Pressure Lamp



$m_{\text{Hg}} \sim 100 \text{ mg}$
 $P_{\text{el}} \sim 10 \text{ kW}$



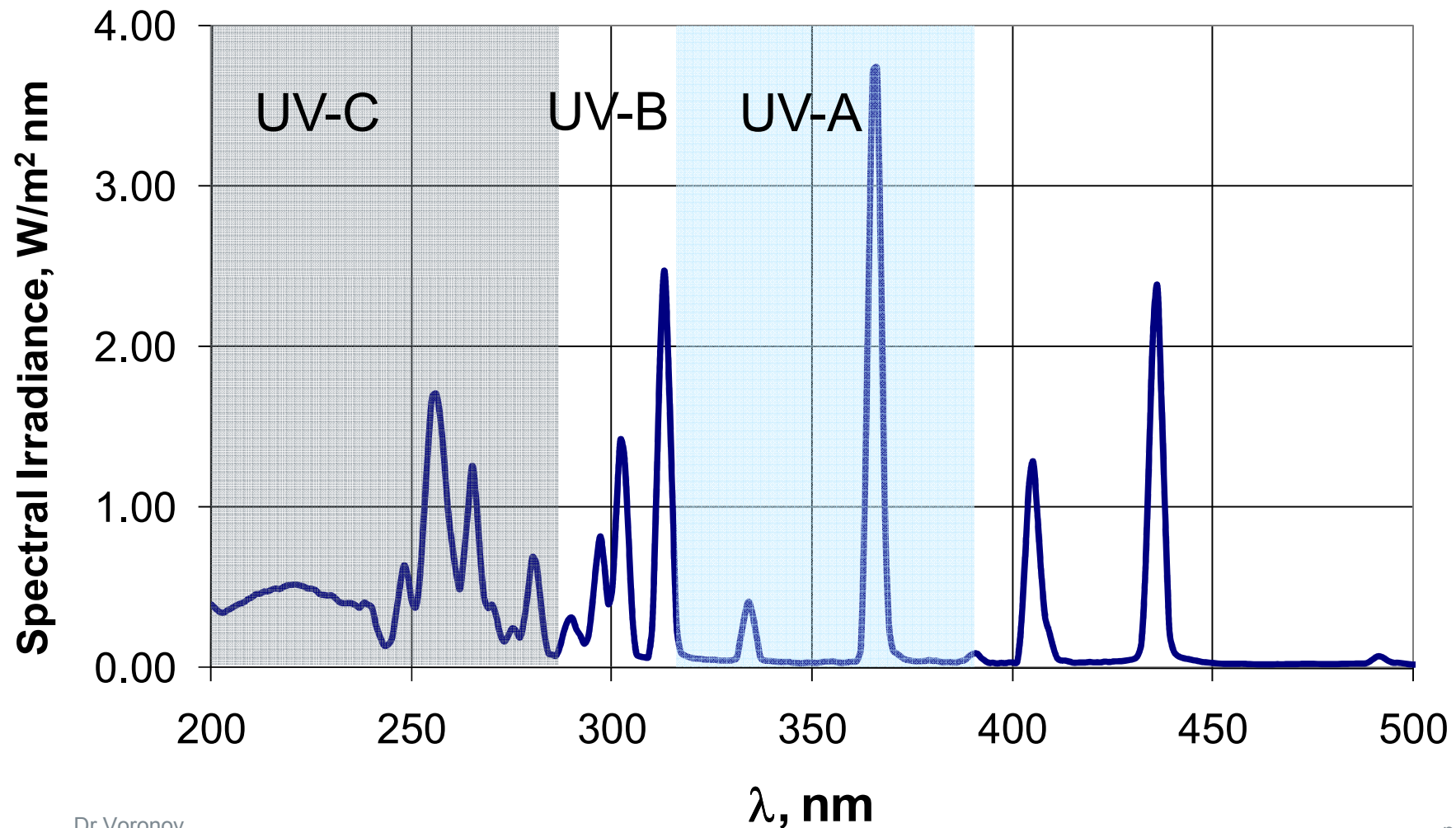
Spectrum of MP Lamp and DNA Absorption



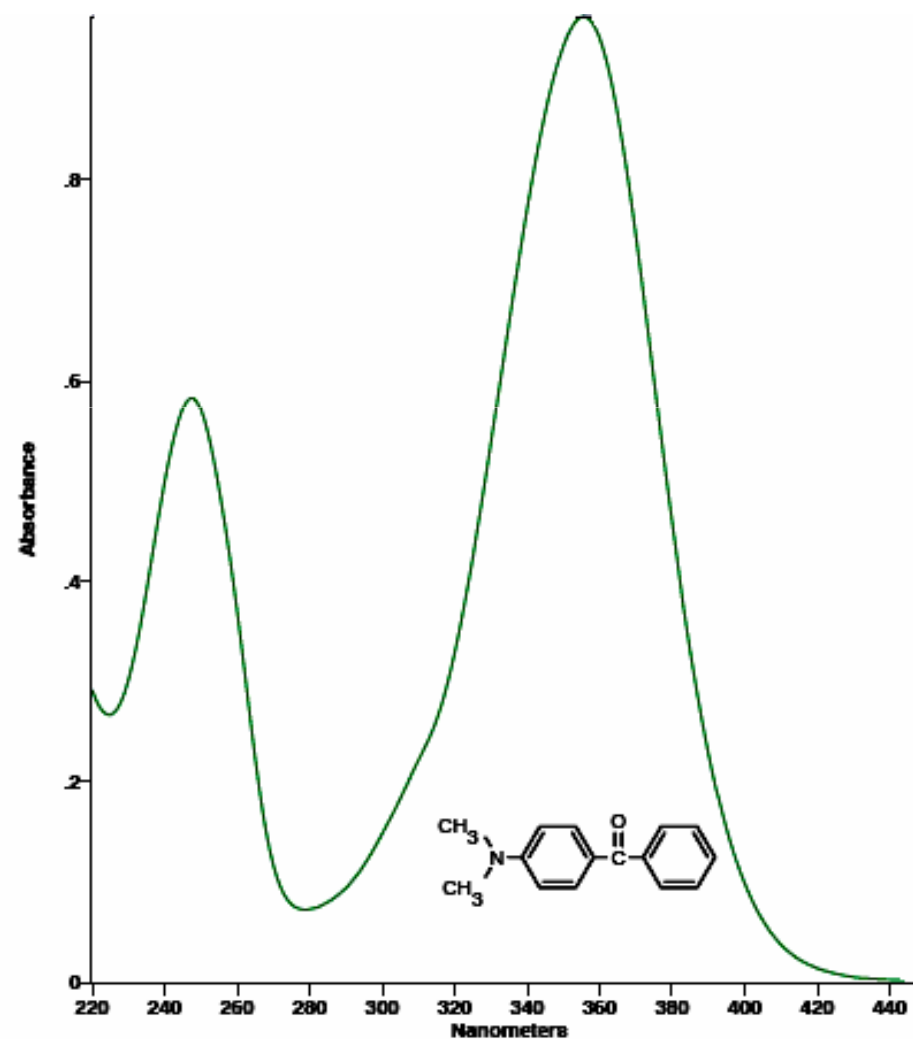
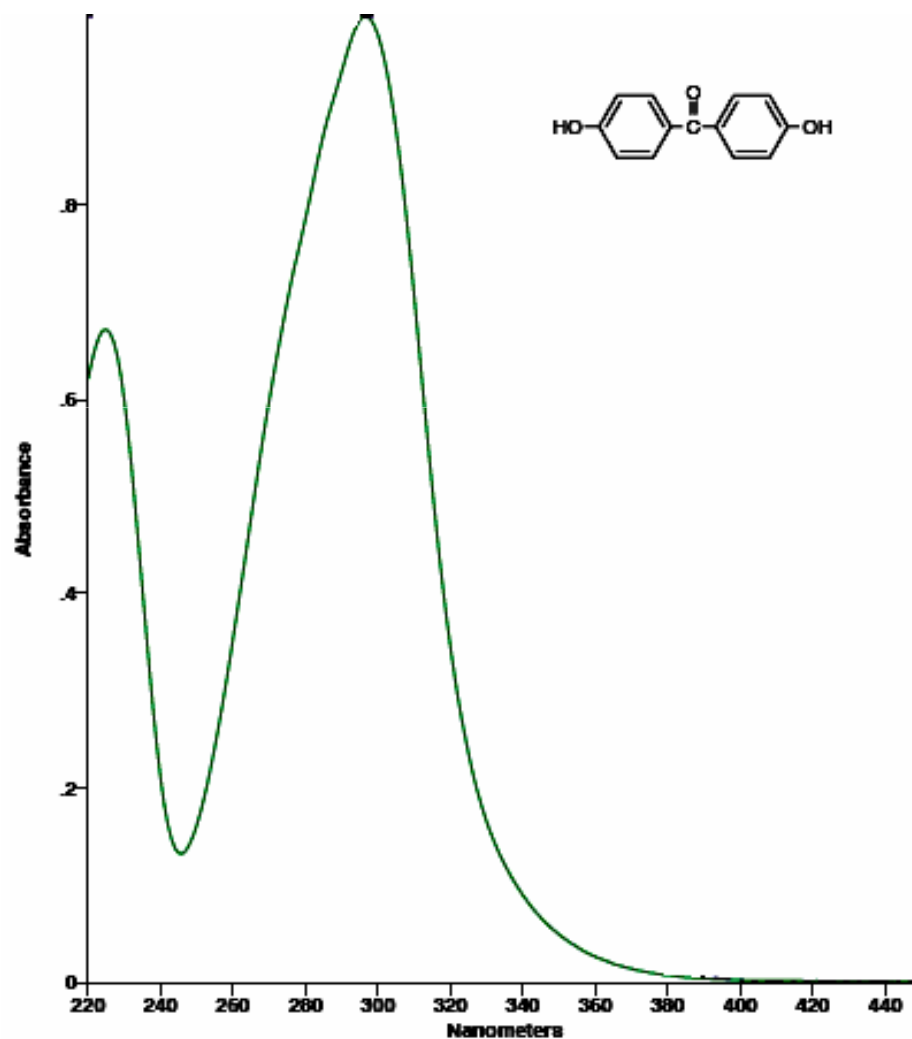
MP Lamps for Water Disinfection



MP Lamps – Spectra in UV-A and UV-B Regions



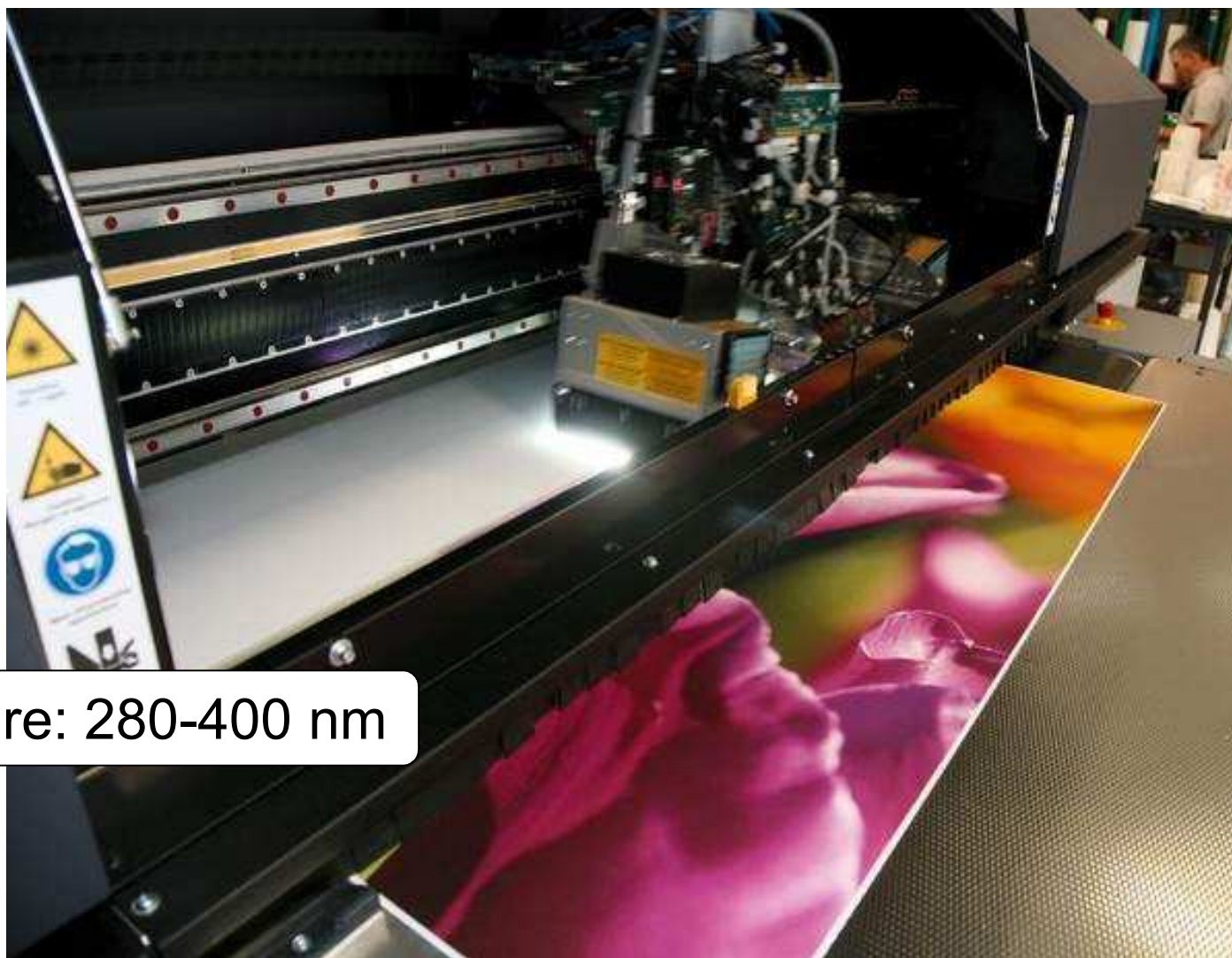
Absorption Spectra of Photoinitiators



Printing Industry

Ink Curing
in Printing
Industry

Medium Pressure: 280-400 nm

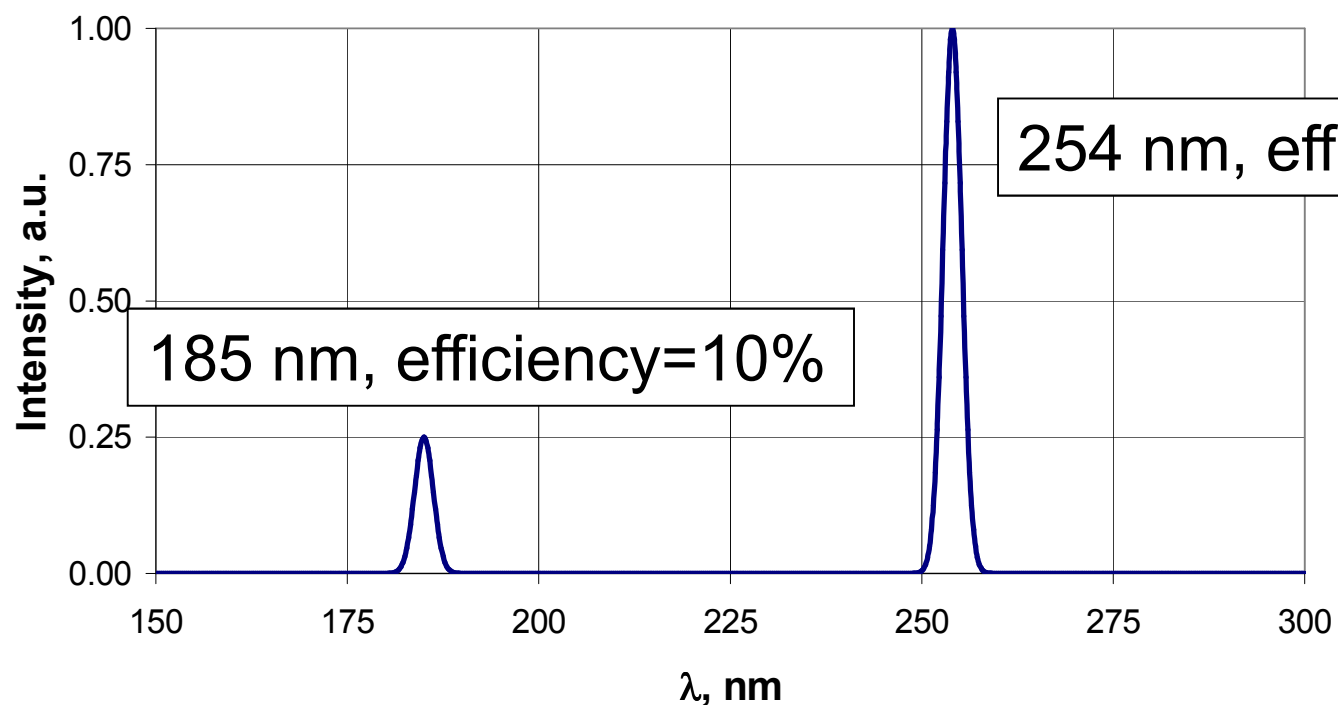


Low Pressure Lamps

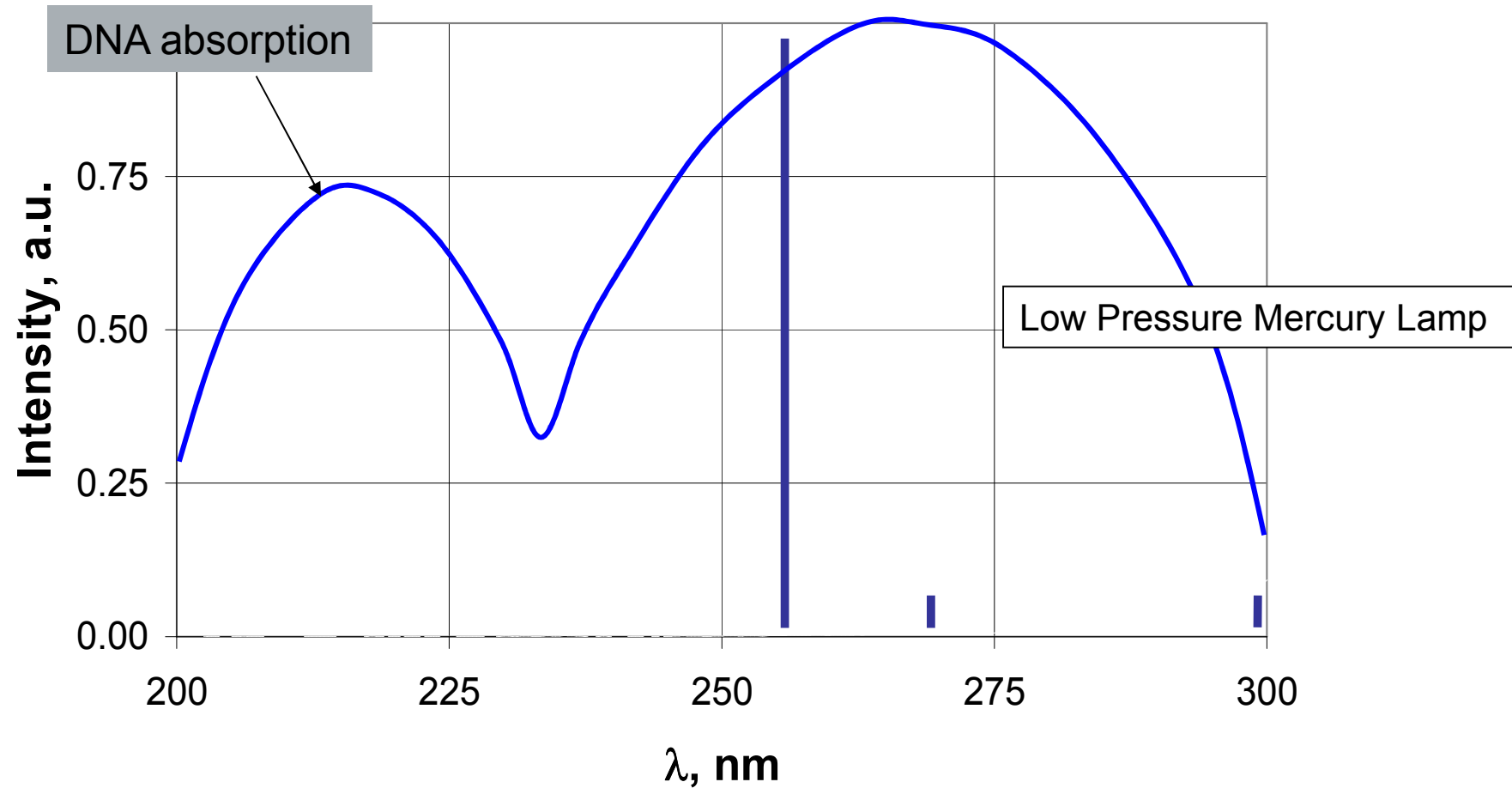
Low Pressure Lamp



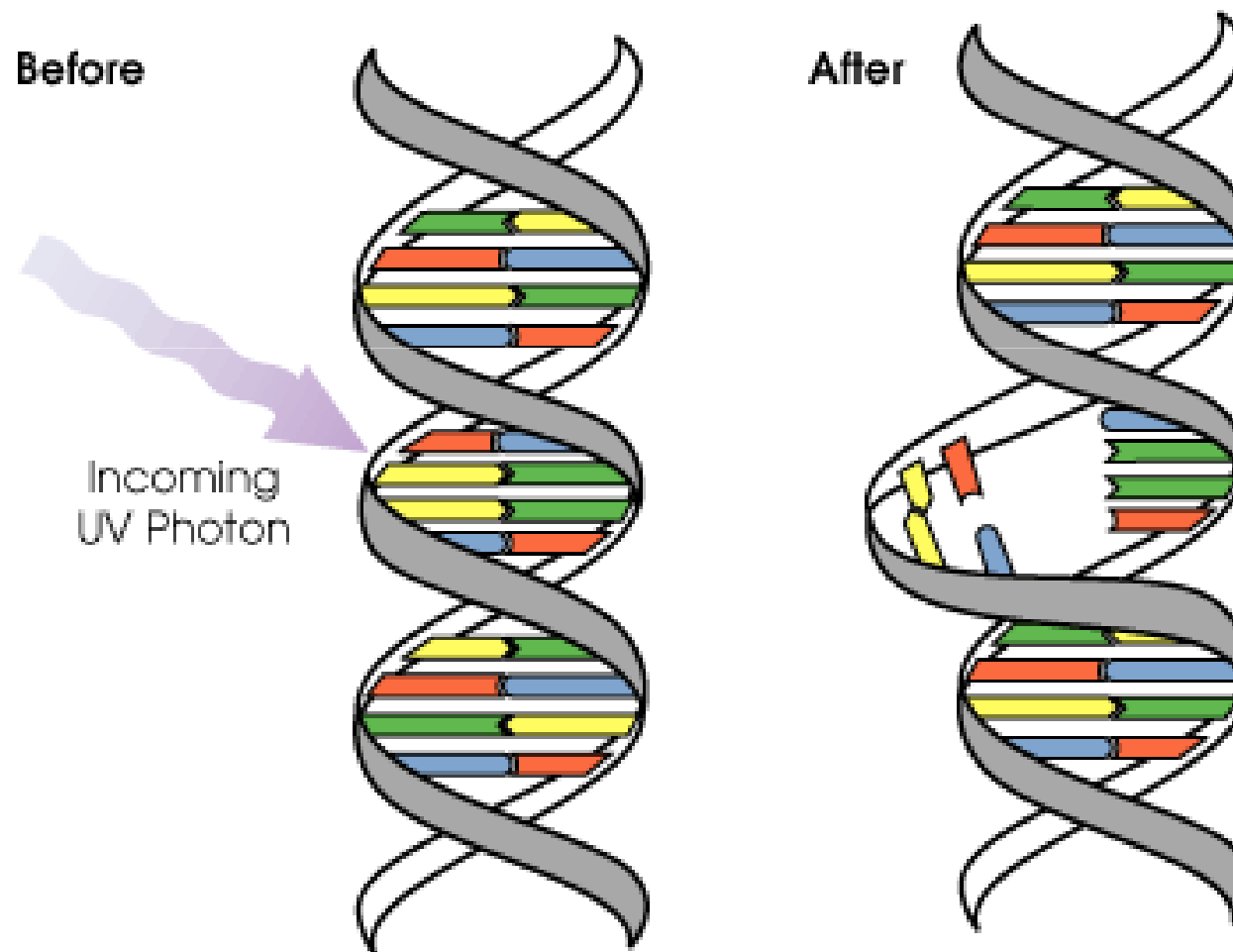
$$m_{\text{Hg}} \sim 10 \mu\text{g}$$
$$P_{\text{el}} \sim 300 \text{ W}$$



Spectrum of Hg-Lamps and DNA Absorption



DNA Destruction



Water Disinfection



Low Pressure Lamp: 254 nm

Air Treatment - Kitchen Hoods

BBC NEWS | Europe | Detainees killed in Dutch blaze - Internet Explorer bereitgestellt von Heraeus

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Detainees killed in Dutch blaze

At least 11 people have died, and 15 are in hospital, after a three-hour blaze in a detention centre at Amsterdam's Schiphol airport.

The blaze broke out soon after midnight in the centre, which houses illegal immigrants and drug smugglers awaiting deportation from the Netherlands.

Officials say the emergency services acted quickly

Some of the 350 prisoners at the centre said guards were slow to respond to their cries for help.

Police said they were looking for some detainees who may have escaped.

Witnesses described flames licking from the windows of the prefabricated complex, which is sited only yards from one of the runways on the east side of the airport.

Dutch Prime Minister Jan Peter Balkenende said: "It's terrible if you hear about a fire of such size, 11 people dead."

"Our thoughts are with the families of the victims and the wounded."

Warnings 'ignored'

The cause of the blaze is still unknown.

"The 11 who died were detainees," said local Mayor Michel Bezuijen, but their nationalities and identities were not released.

BBC NEWS: VIDEO AND AUDIO
Pictures of the blaze and its aftermath
[VIDEO](#)

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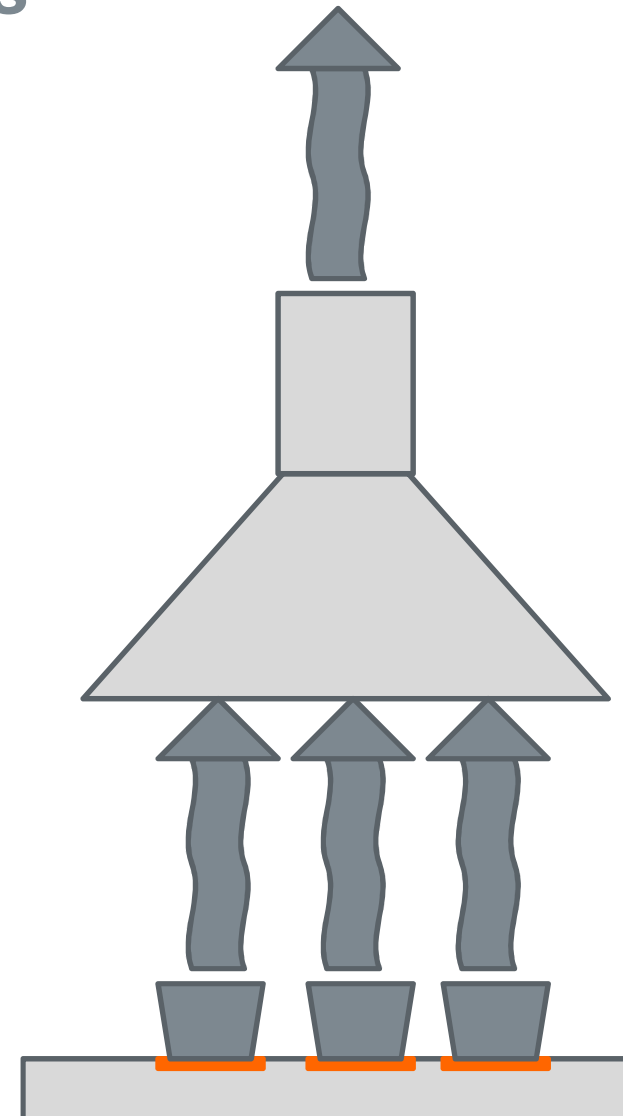
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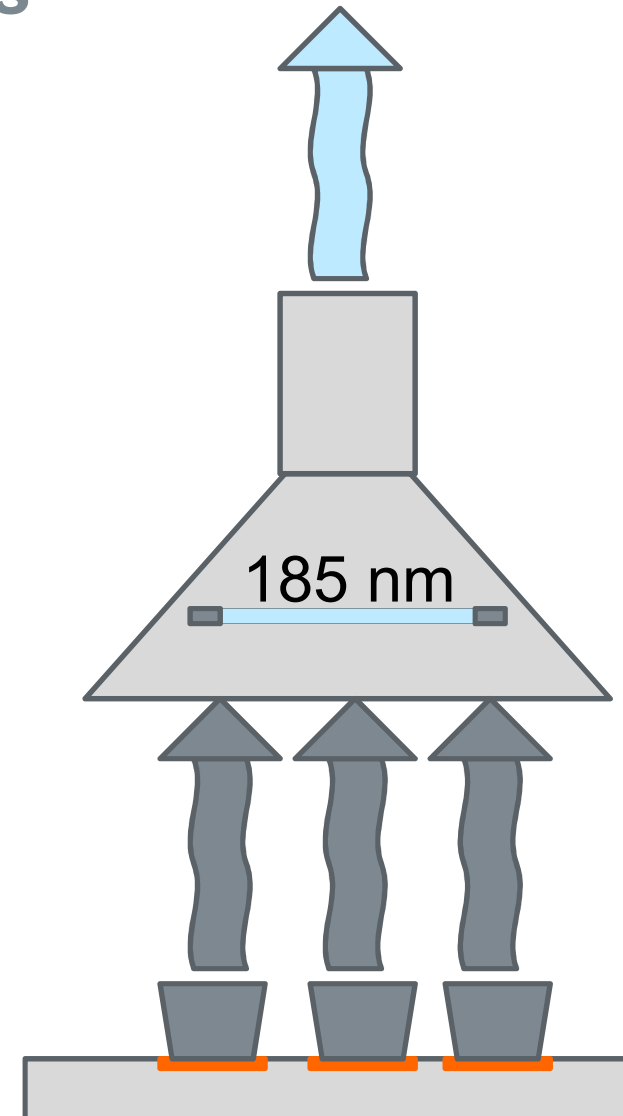
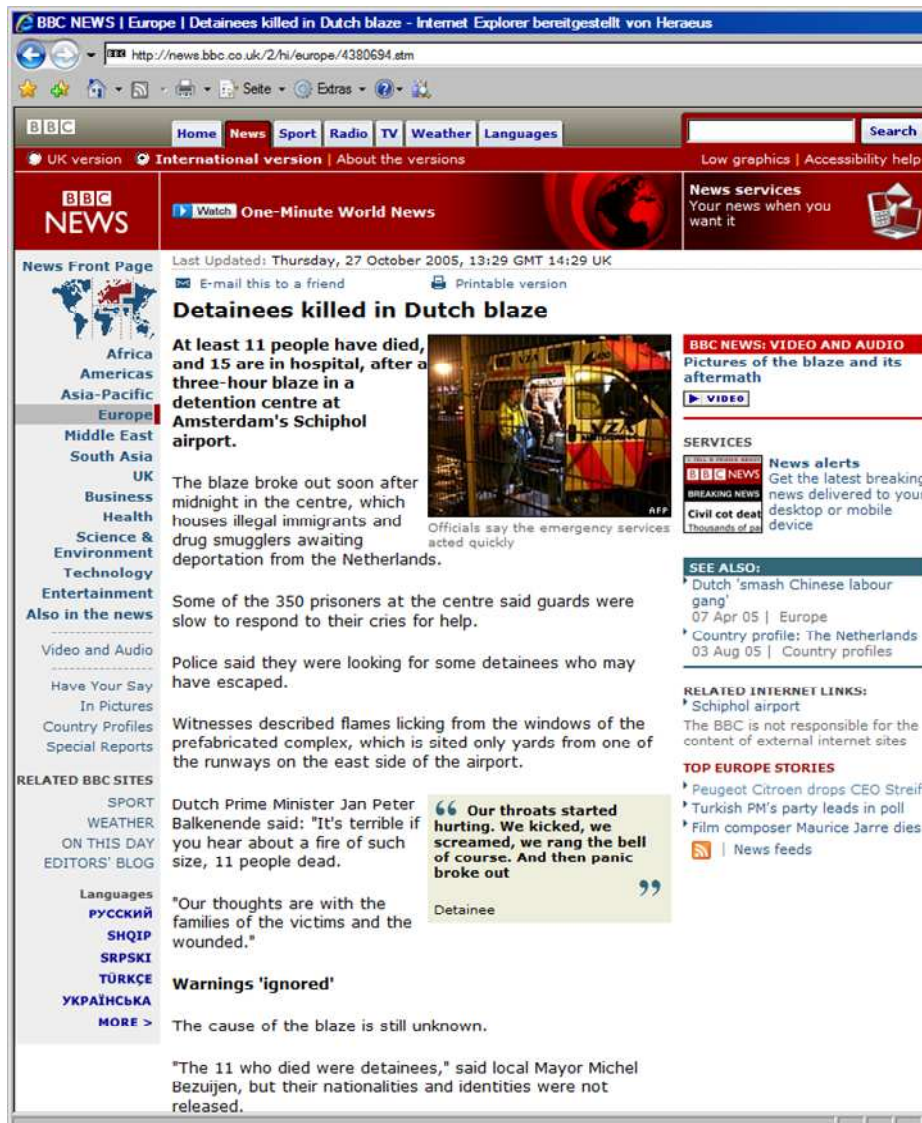
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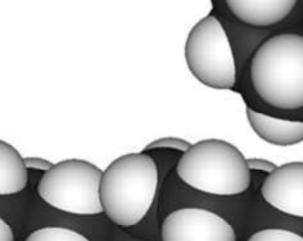
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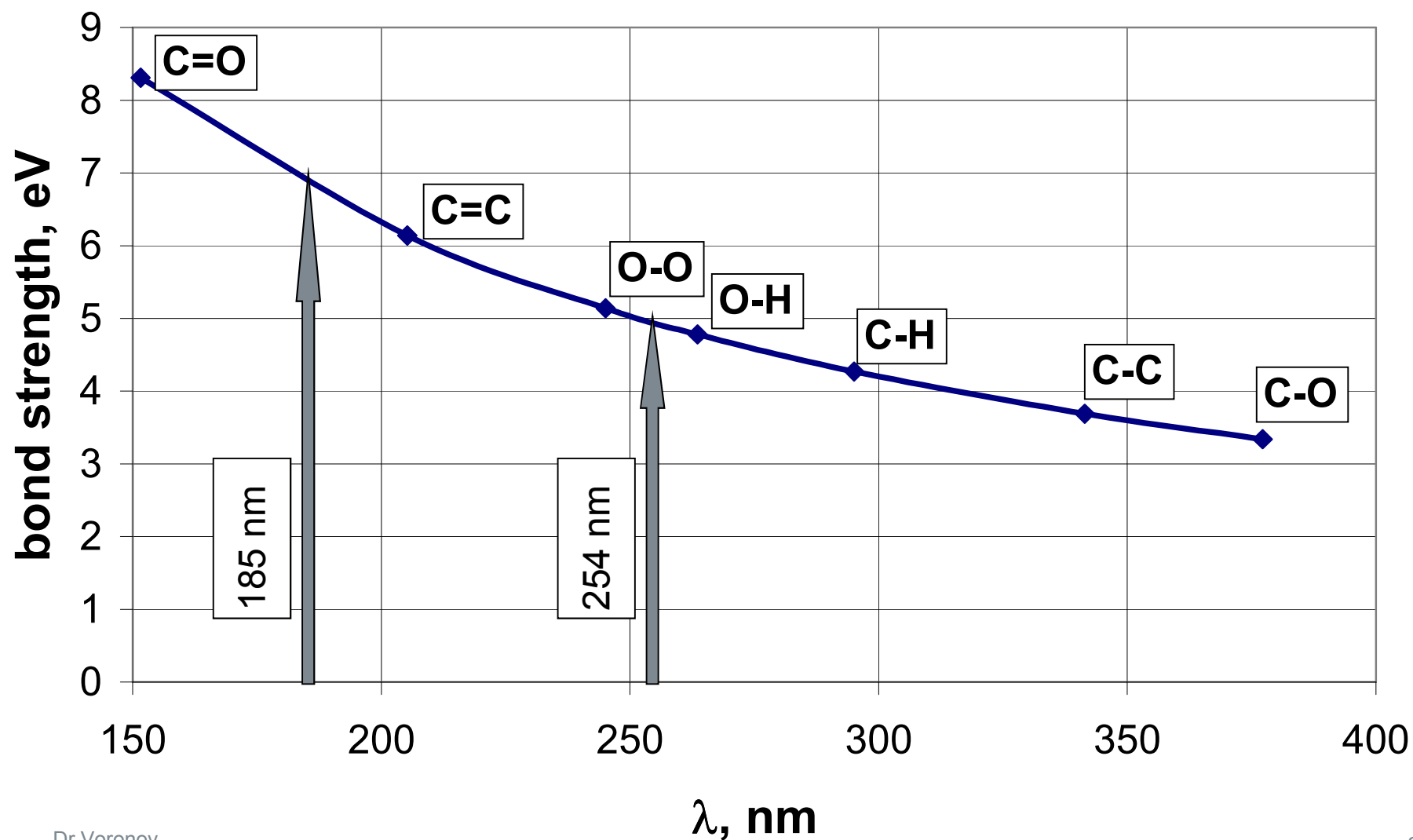
Air Treatment - Kitchen Hoods



[illegible]

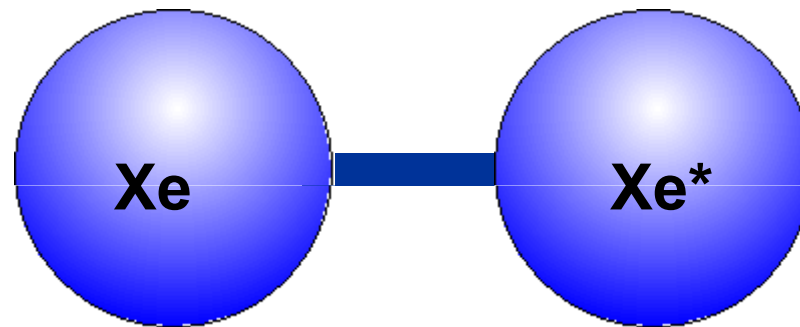
C=O $\lambda < 162$ nm

Bond Strength vs. Photon Energy



Xe_2^* Excimer Lamp (172 nm)

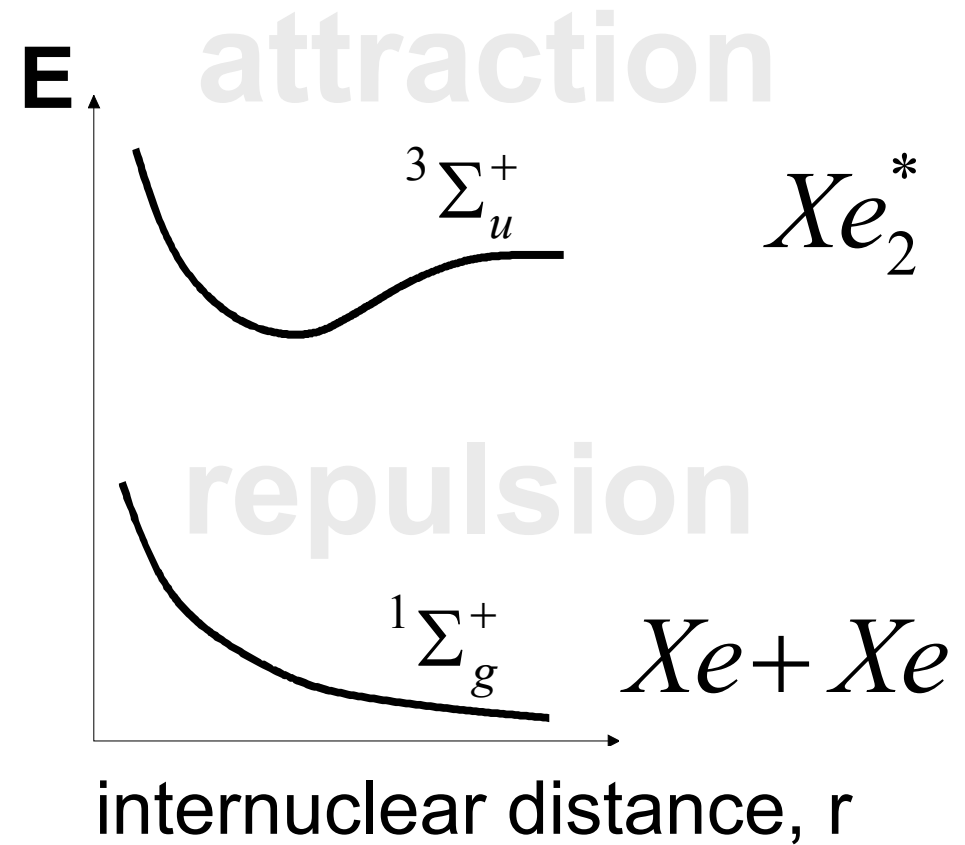
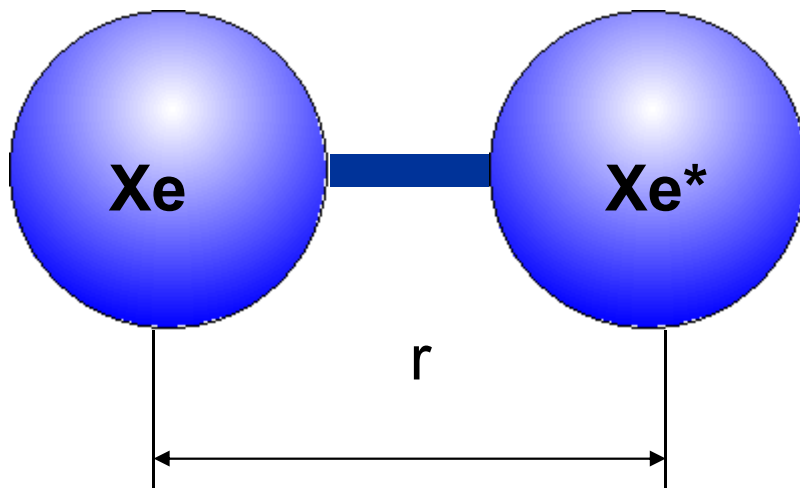
Excimer Molecule



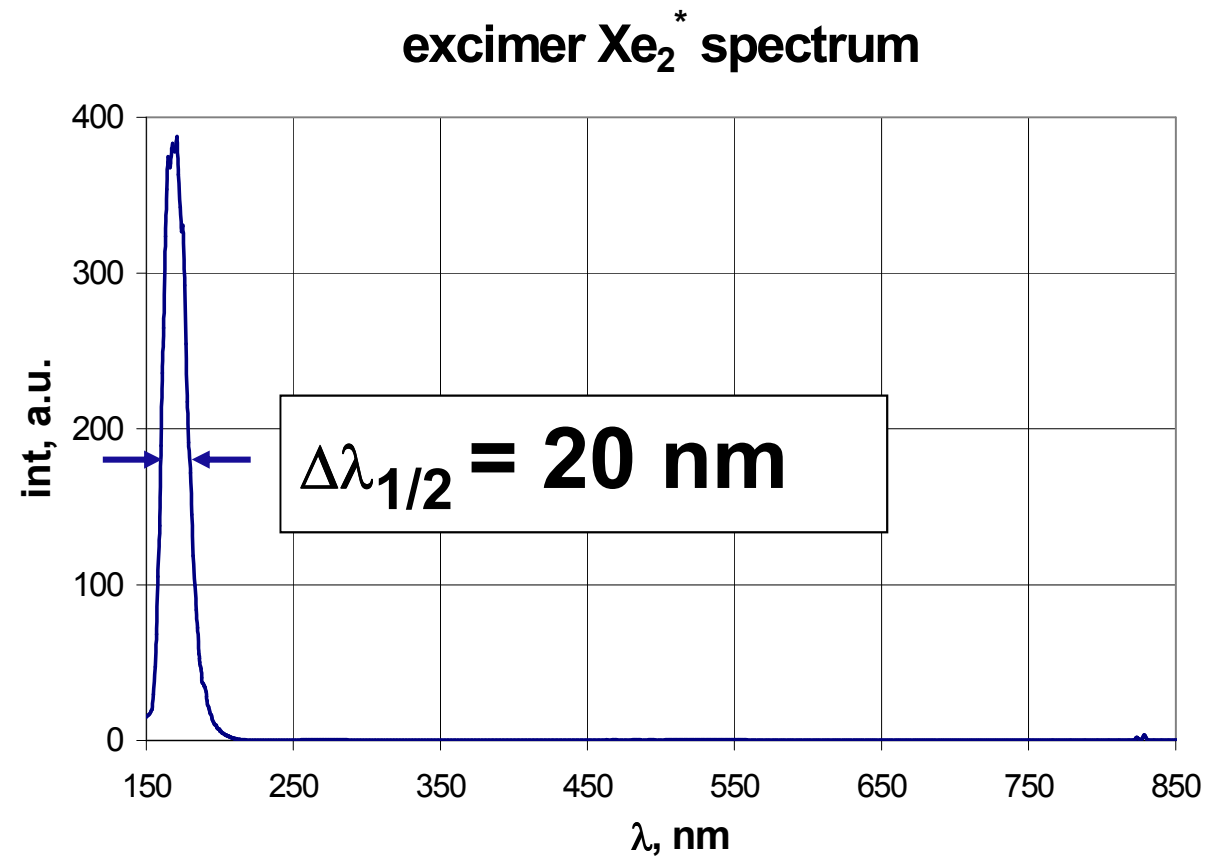
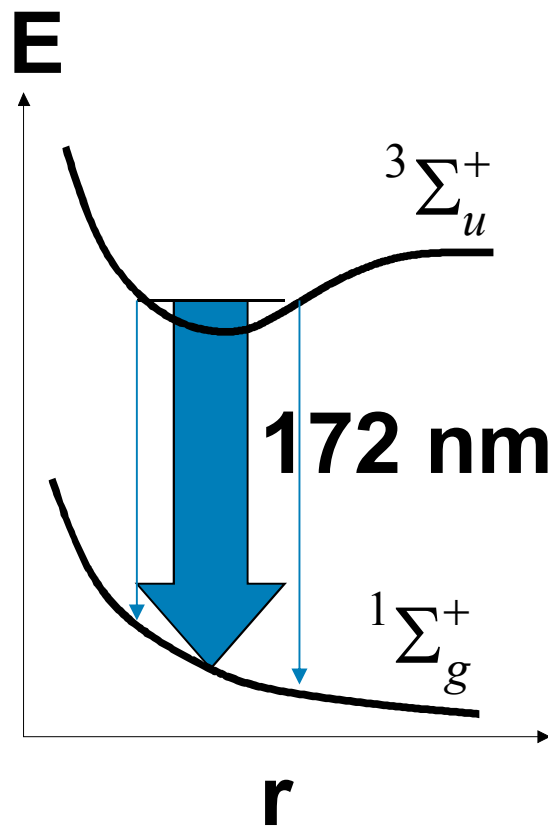
Excited Dimer

Life Time ~ ns

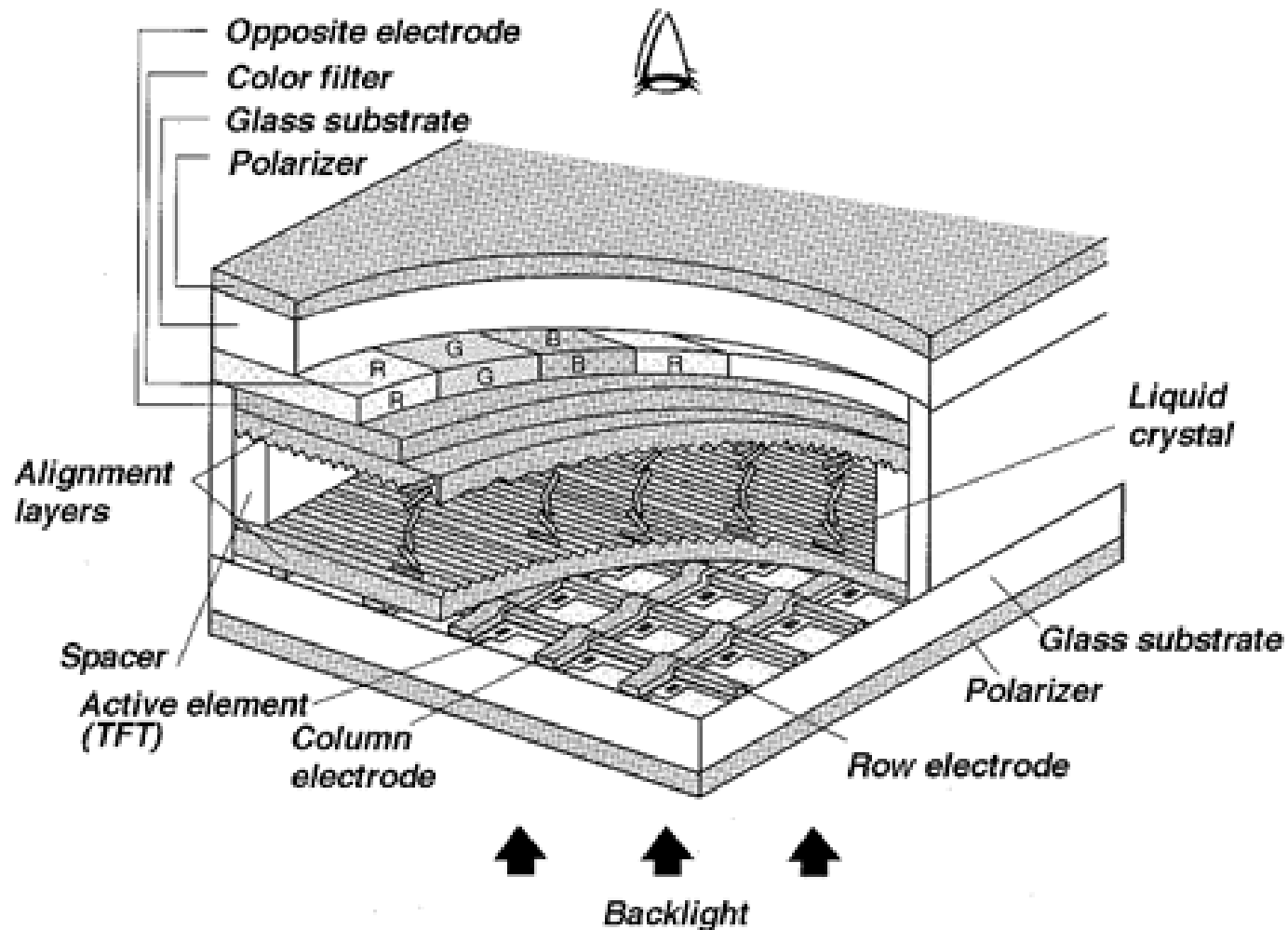
Excimer Molecule Xe_2^*



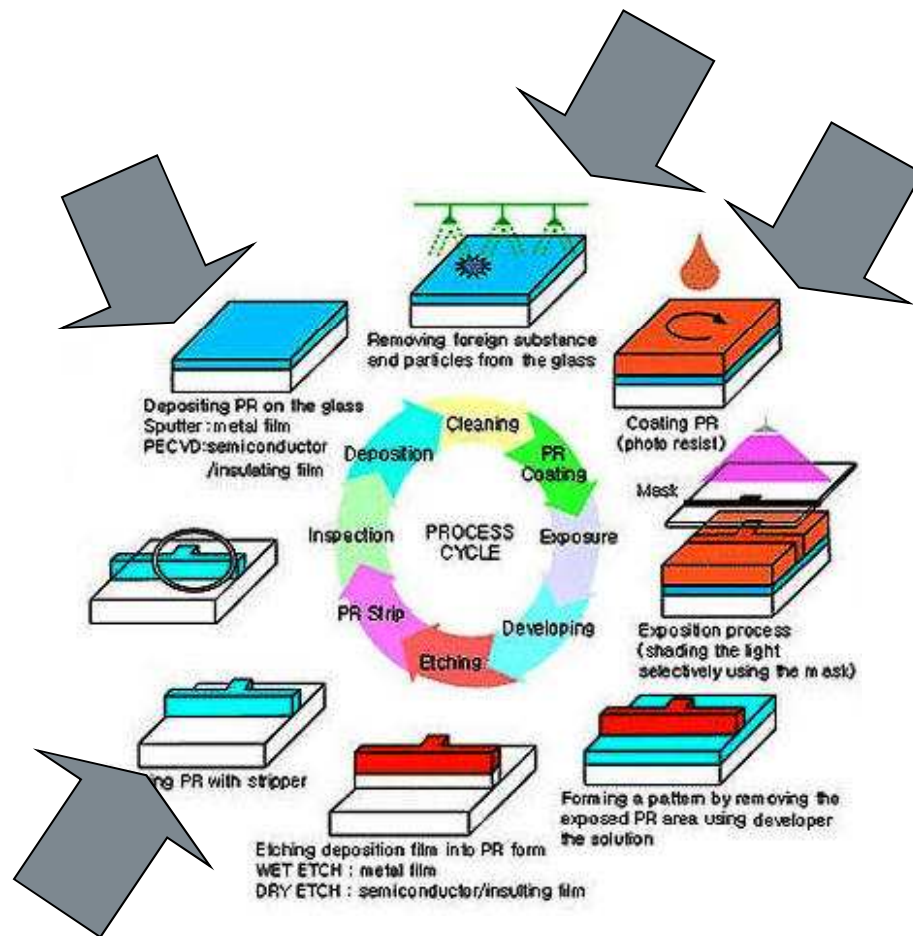
Emission at 172 nm



LCD Cross Section

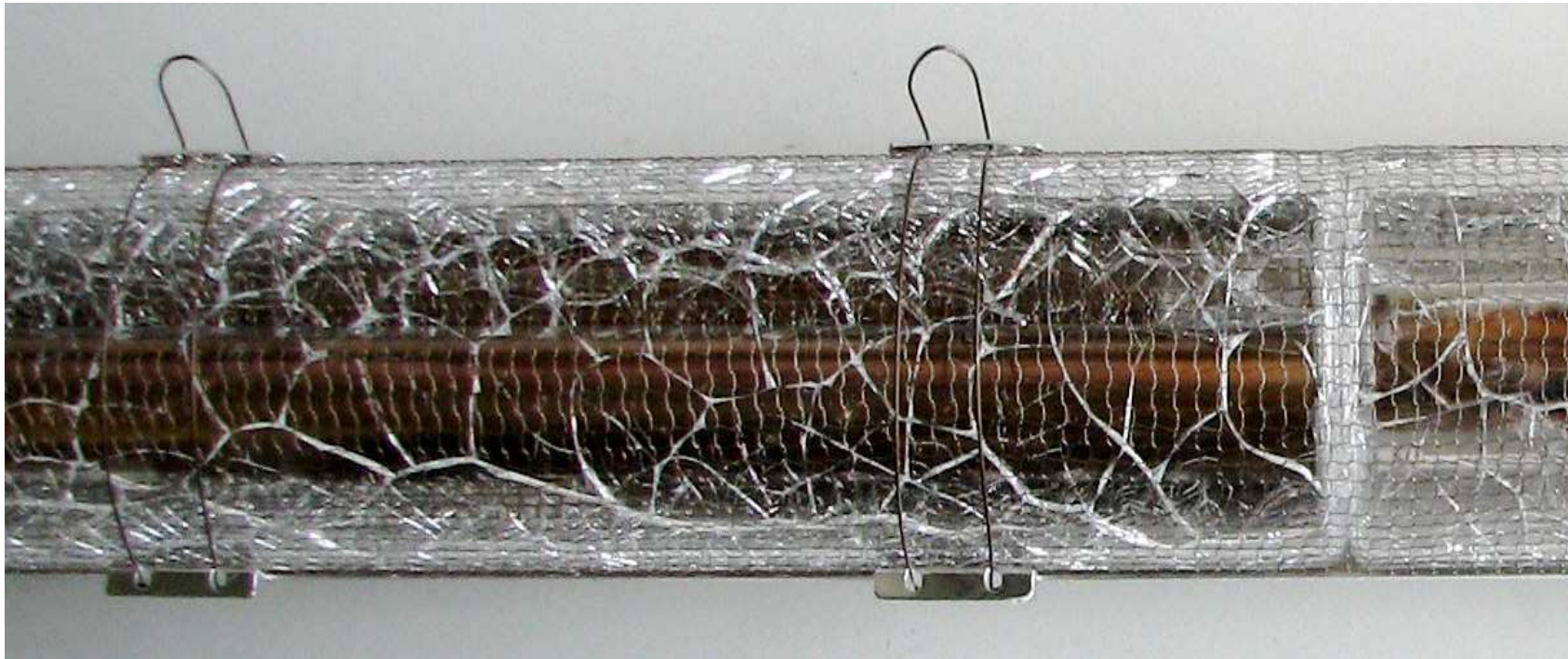


VUV-Light, $\lambda=172$ nm



- Removal of Cleaning Agents
- Surface Conditioning
- Polymer Removal

Quartz Destruction by Photons

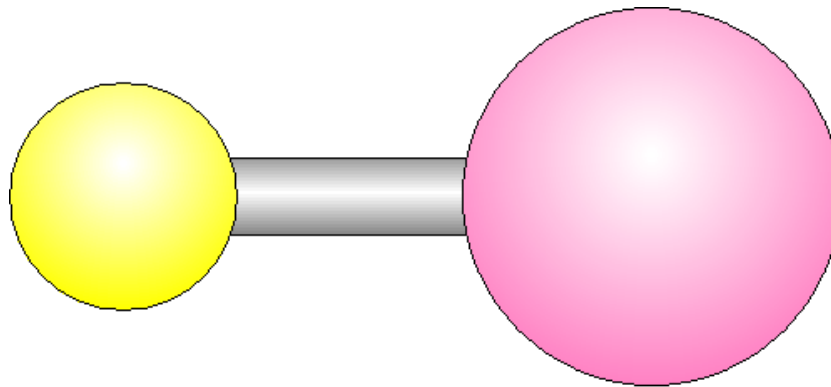


Excimer Lamps: Mercury Free UV-Light Sources

Excimer Molecule Rare Gas + Halogen

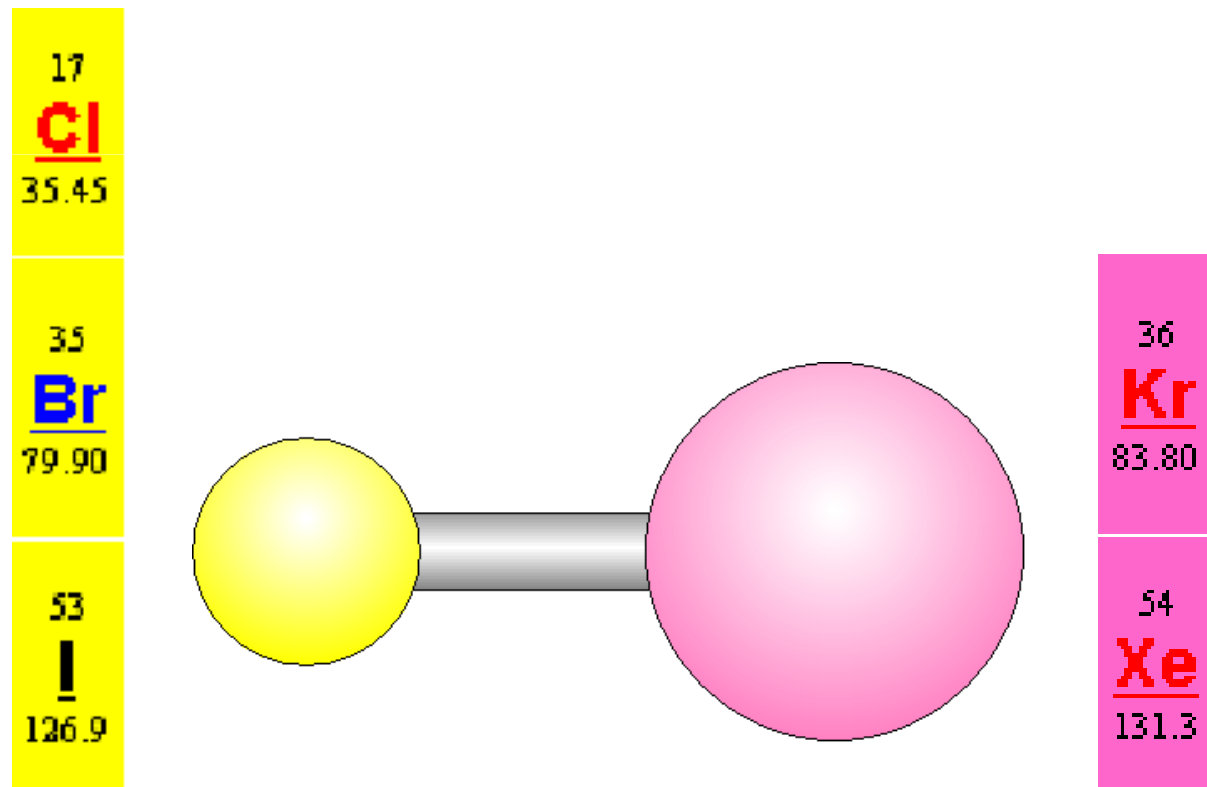
High Emission Efficiency Condition:

Light Halogen + Heavy Rare Gas Atom

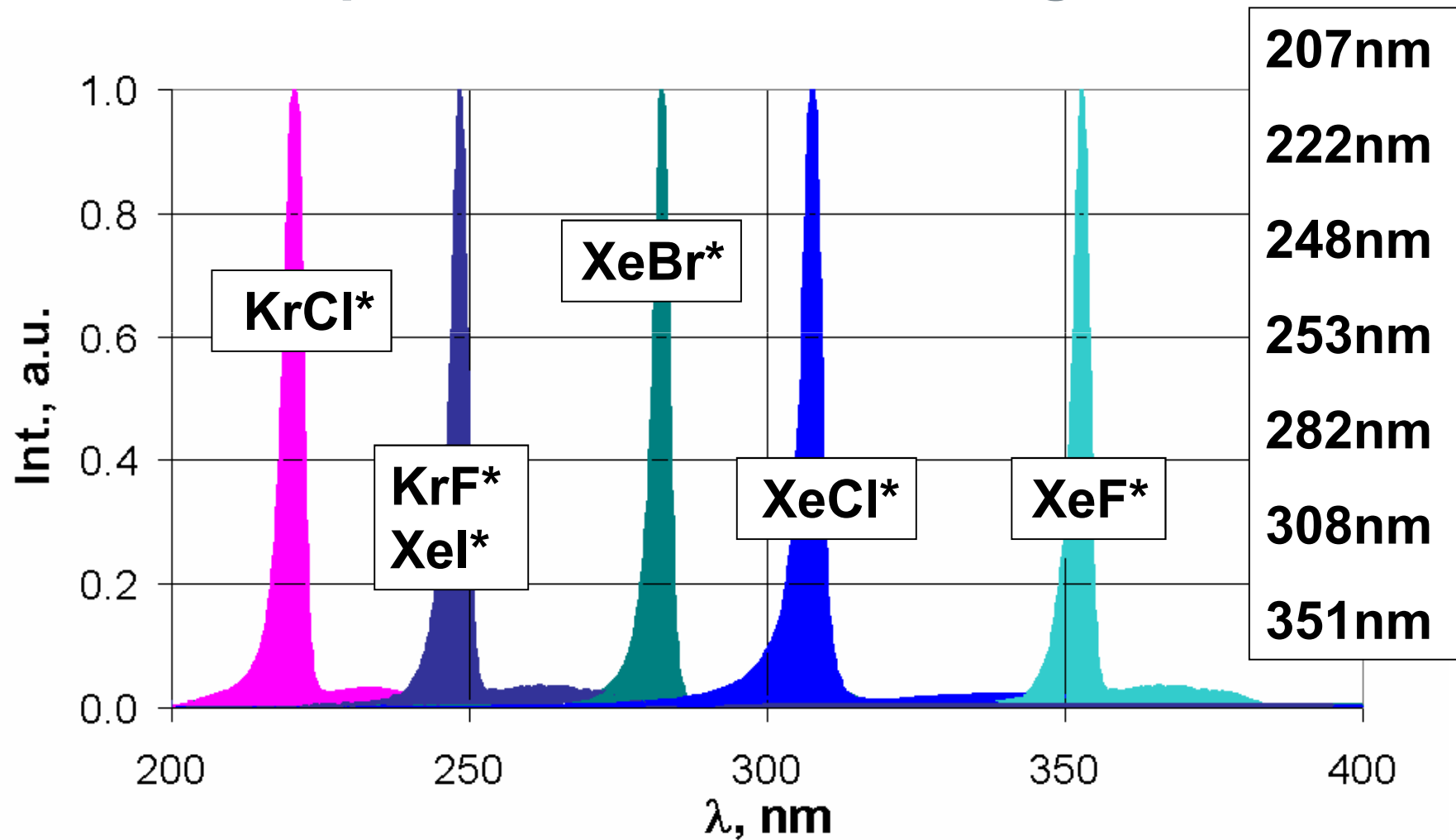


9 F 19.00	
17 Cl 35.45	
35 Br 79.90	36 Kr 83.80
53 I 126.9	54 Xe 131.3

Excimer Molecule Rare Gas + Halogen



Excimer Spectra: Rare Gas + Halogen

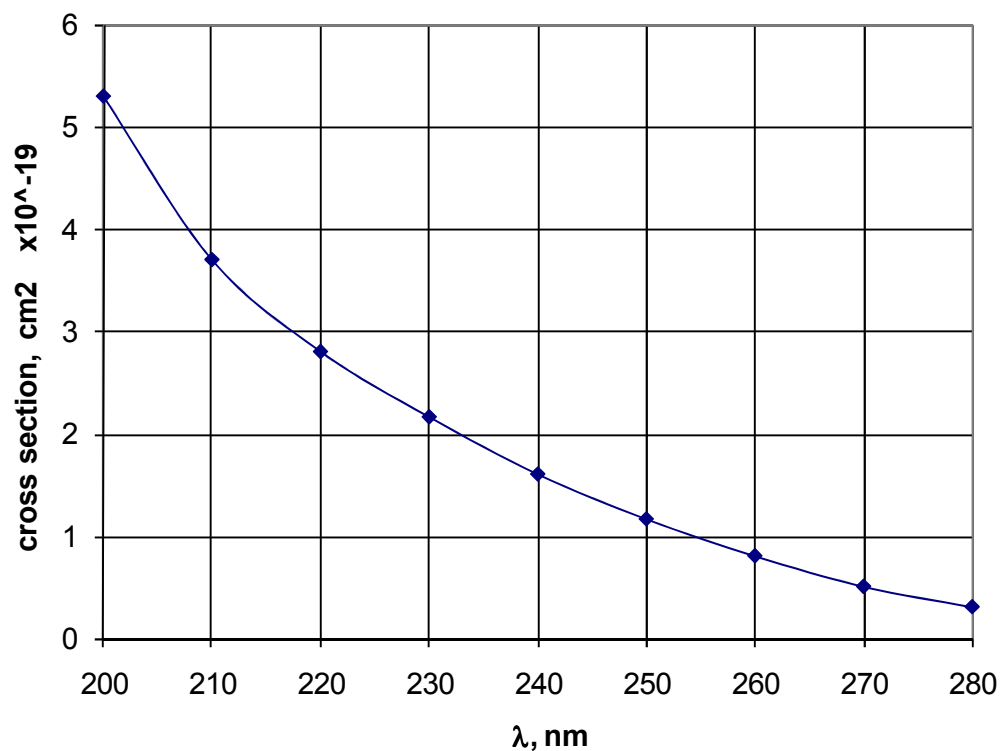


XeCl* (308 nm) for Treatment of Psoriasis

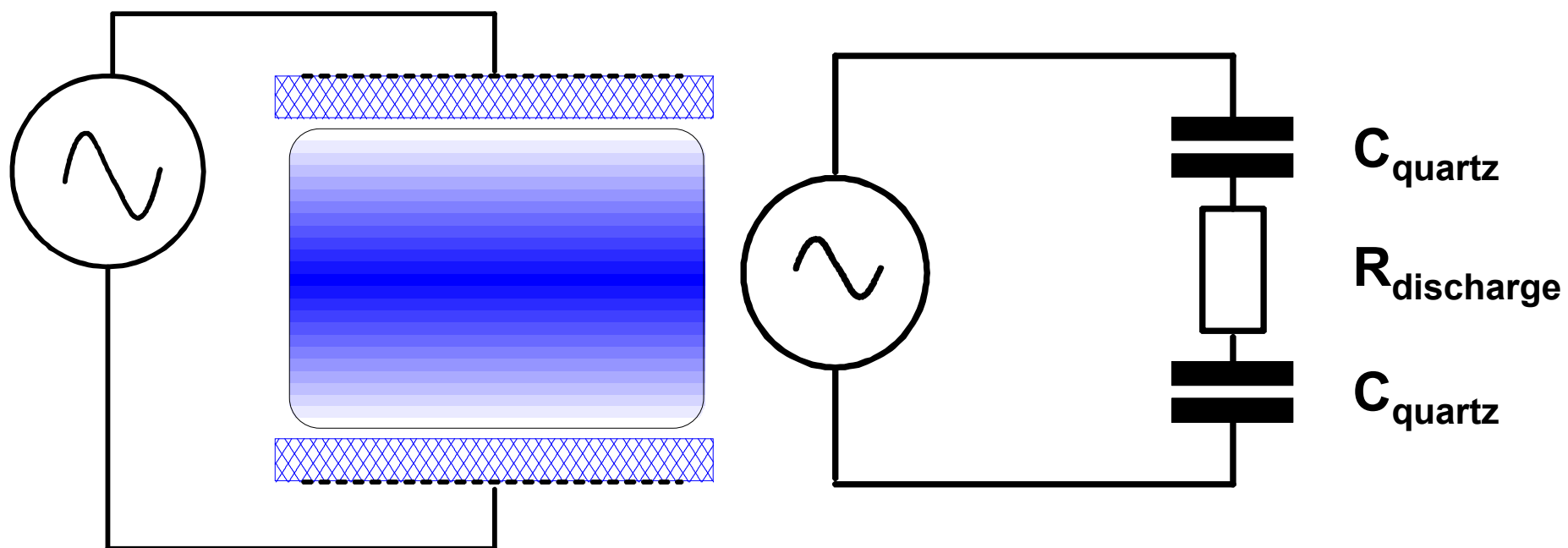


KrCl* (222 nm) for Surface Disinfection

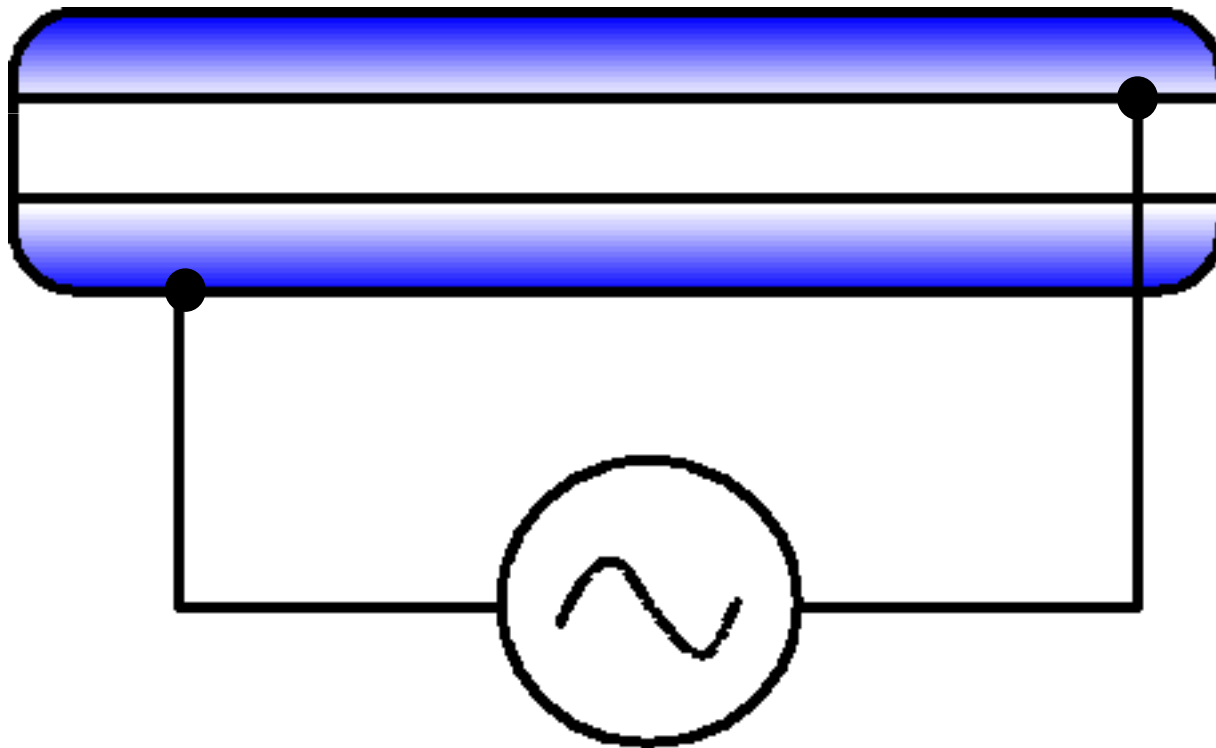
UV-absorption of H₂O₂



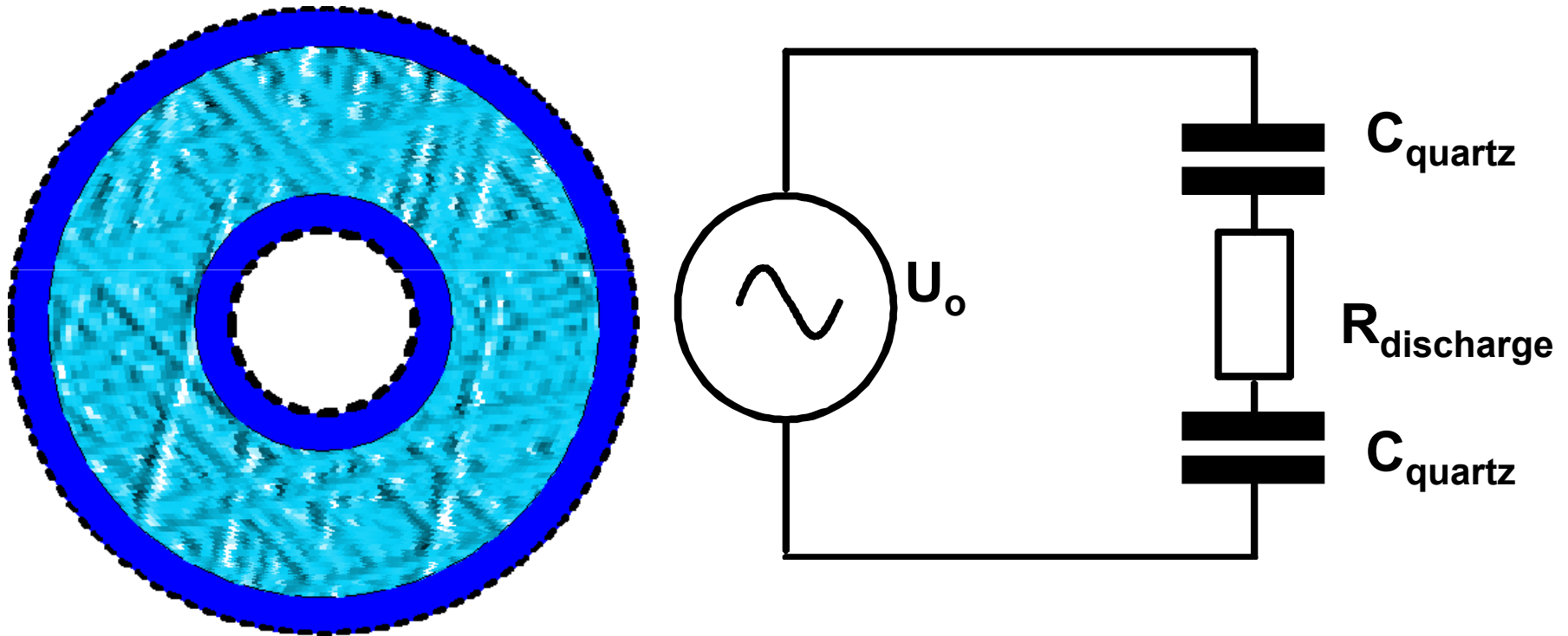
Barrier discharge lamp



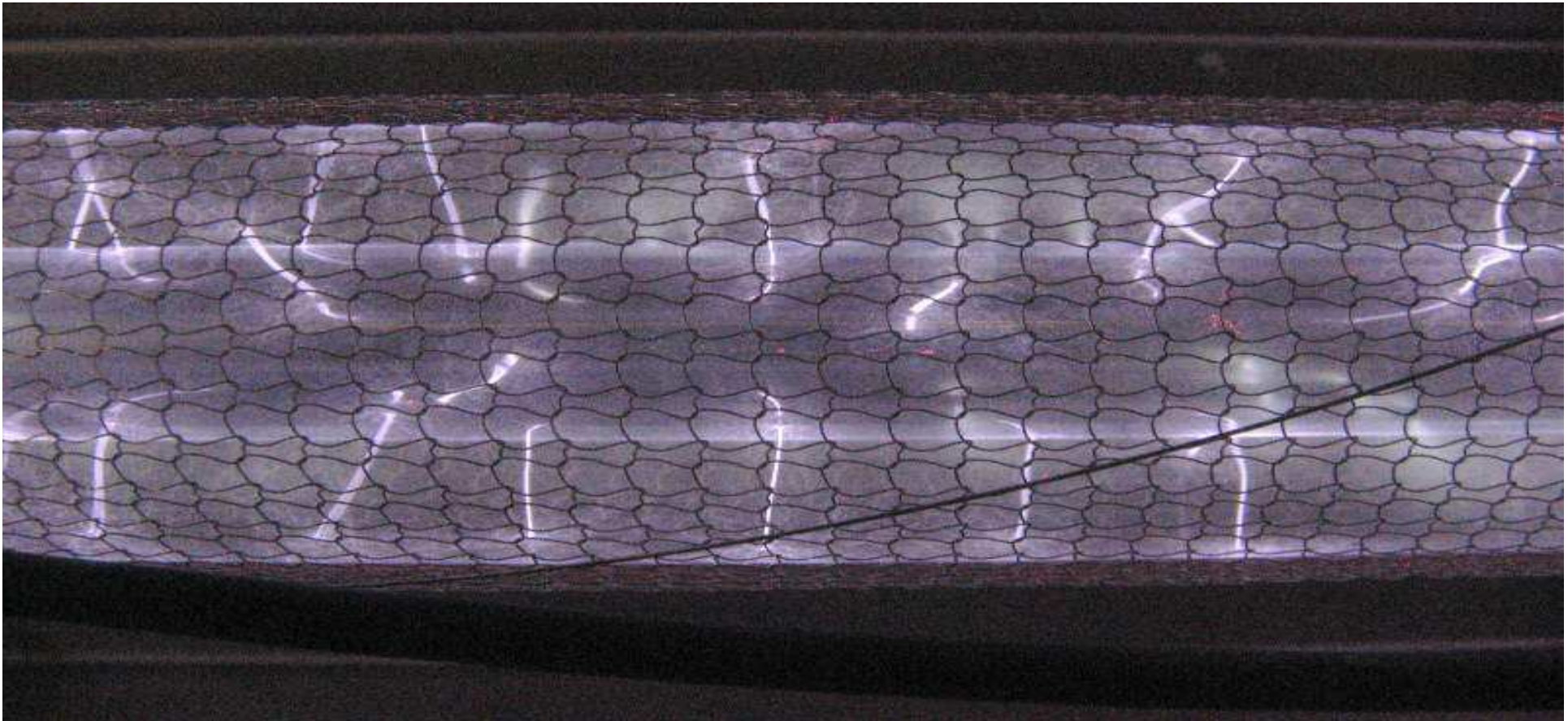
Dielectric Barrier Discharge



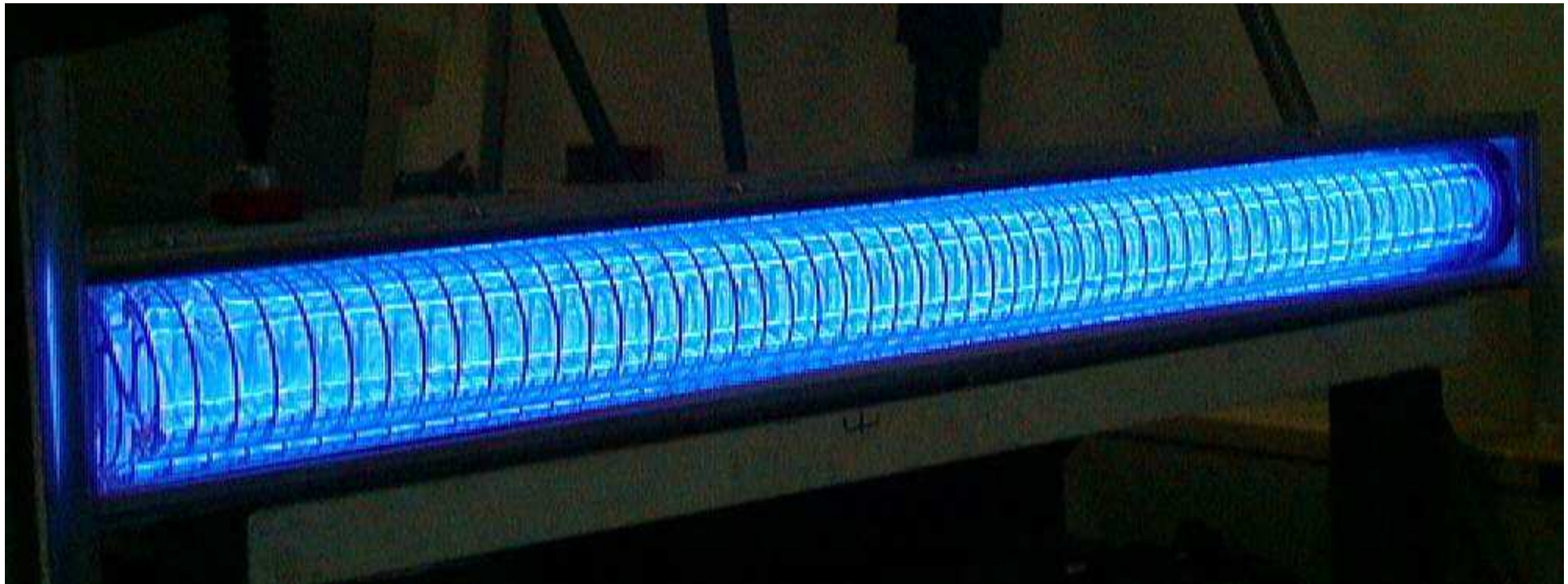
Barrier Discharge: Operation



Mesh Electrode of DBD Lamp

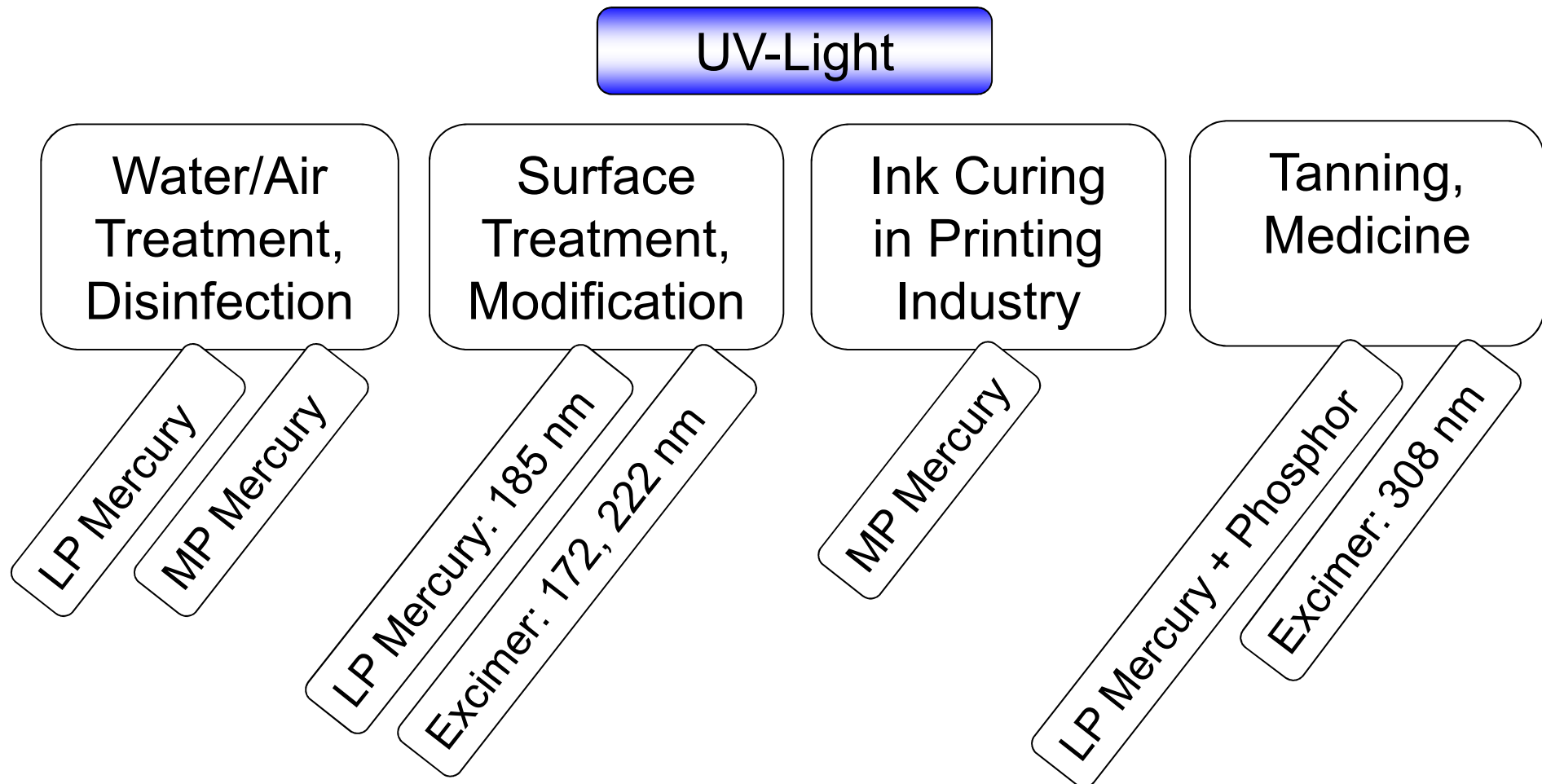


Spiral Electrodes of a DBD Lamp



Conclusions

Application Areas of UV-Lamp



Thank You for Your Attention!