

# Team II: 'The Free Radicals'

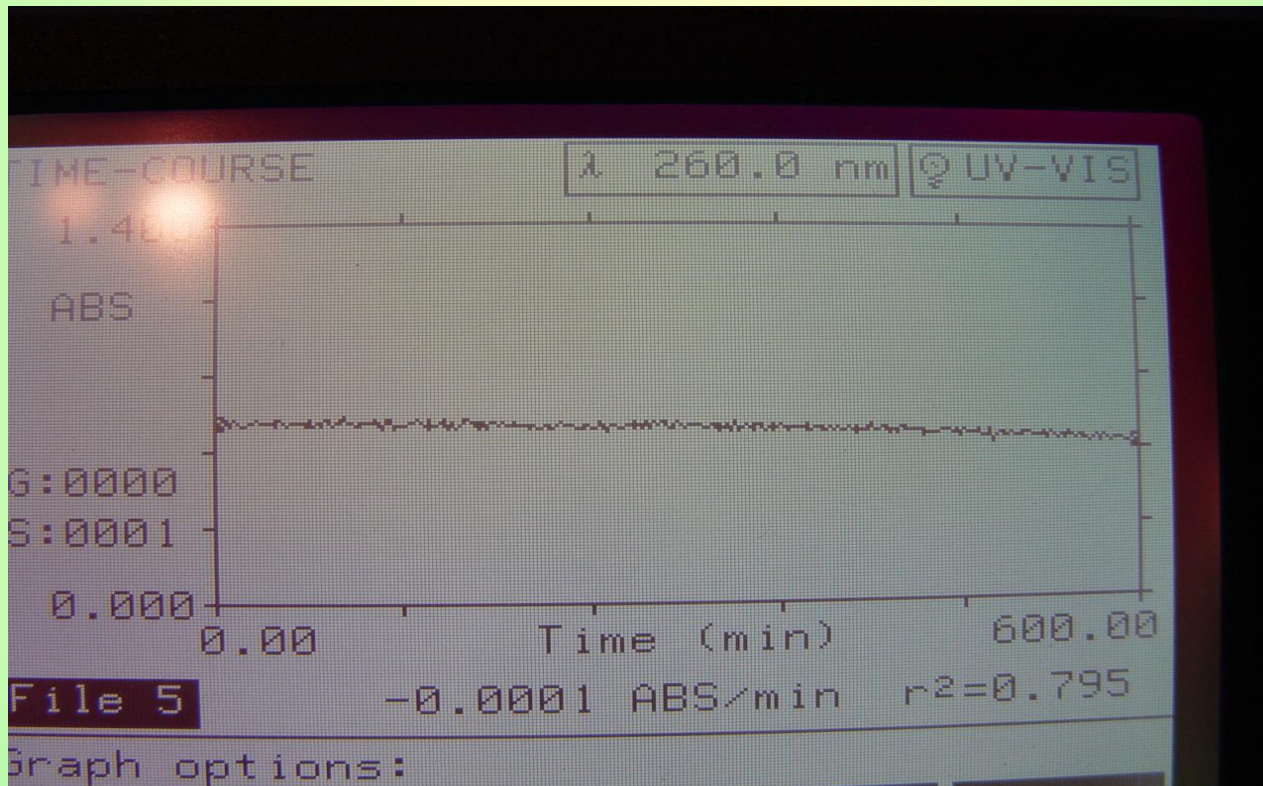
$O^{-2}$

Members:

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Sponsor: Professor Cheng

# Experimental evidence for free radical stabilization in a PFC.



Ozone in pfc solution, stable at full concentration for 5 hours, and up to 30 days when in a frozen state at -50C, 16 days at -20C.

# Background on existing therapies

- Photodynamic Therapy: where a light sensitive agent is injected intravenously. A surgery Must Be performed to expose tissue to light waves that activate free radicals to cause apoptosis.
- Problems with existing, method, light waves do not penetrate tissue effectively, and one must undergo a surgical procedure to expose diseased tissue
- Prolo-therapy, is an injection technique where ozone is bubbled through a saline solution and injected into a damaged ligament to stimulate a cascading immune response.
- Problems, Oxygen is not water soluble, so a proper concentration can not be achieved for desired outcomes.

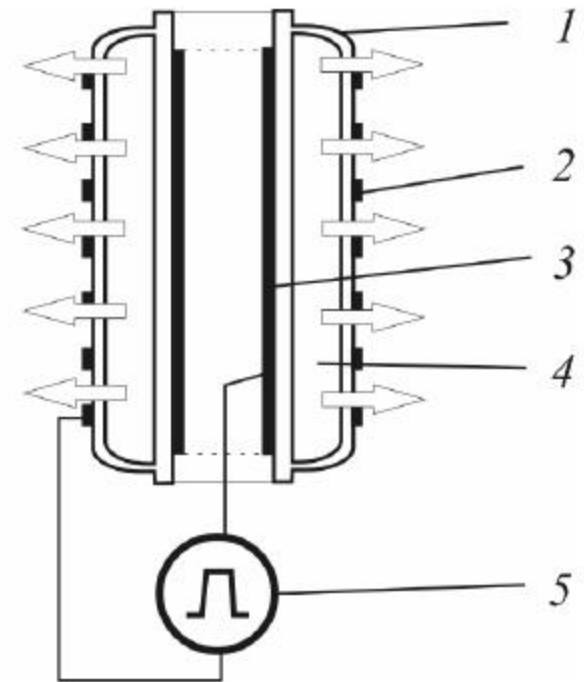
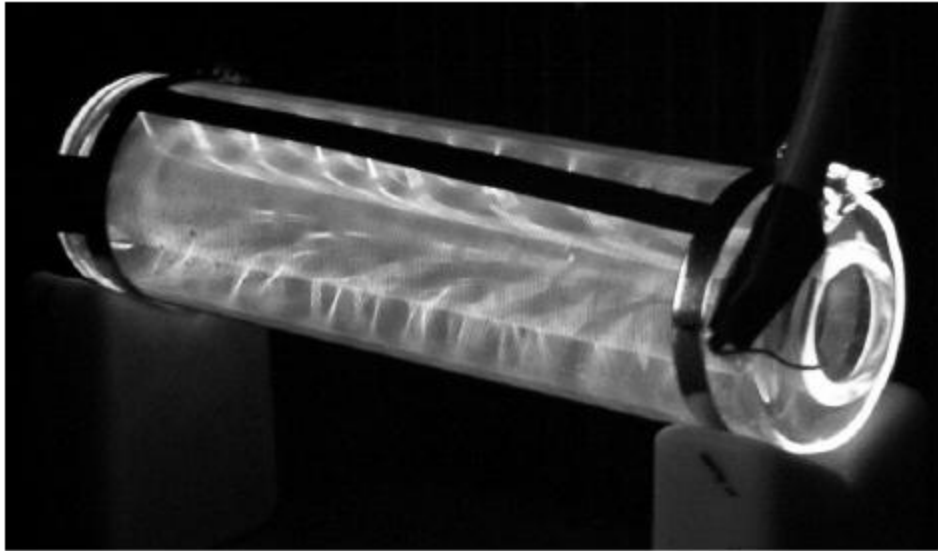
# PRD

- **What:** Photoactivation of oxygen free radicals in an inert PFC solution using light waves at a specific frequency
- **Why:** To replace the contemporary treatment used today (photodynamic therapy).
- **Where:** To be used at the doctors office or in laboratory.
- **Who:** For cancer patients and/or hard healing wounds (cascading immune response)

# PRD

- Design an **excimer lamp** system specifically to induce free radicals within an inert PFC solution.
- For excitation of atoms to produce light waves with enough energy to break oxygen bonds in the PFC solution.
- Improved electrode design with conductive nano-tube film with transmittance of 75% at 200-214nm
- Add Peaking capacitor to increase charge density for even distribution for dielectric breakdown of gas
- Including: lamp housing, circuit design,
- Test different circuit designs to maximize efficiency at a wavelength of 207nm

# Design: Flow Chart



# Components still needed

- Two coaxial GE type 214 quartz tubing to be filled with Krypton bromide 200/1 ratio
- This is a custom piece waiting for a response from manufacture at this point.

# Constraints of design

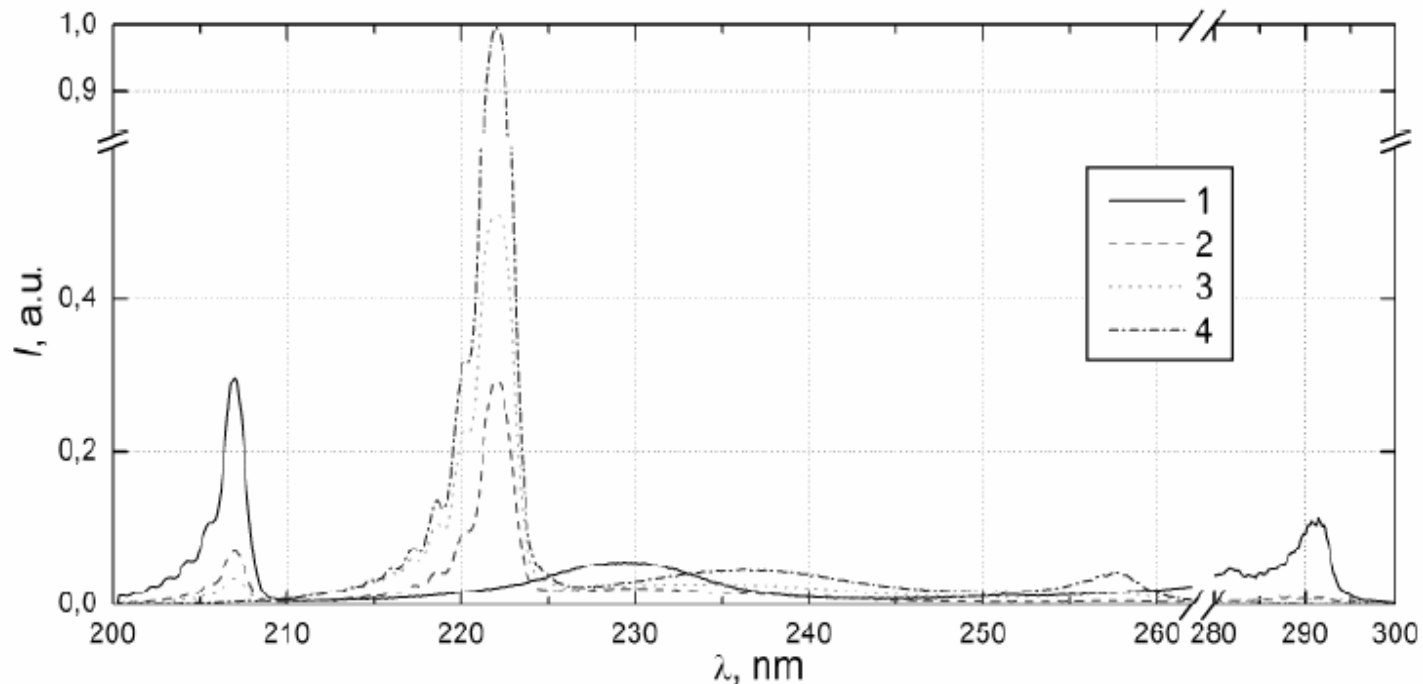


Figure 3: Emission spectrum of BD in the various Kr/Cl<sub>2</sub>/Br<sub>2</sub> mixtures (total pressure of 120 Torr and  $f = 32$  kHz):  
1 – Kr/Cl<sub>2</sub>/Br<sub>2</sub> = 200/0.2/1; 2 – Kr/Cl<sub>2</sub>/Br<sub>2</sub> = 200/0.5/0.5; 3 – Kr/Cl<sub>2</sub>/Br<sub>2</sub> = 200/1/0.5; 4 – Kr/Cl<sub>2</sub> = 200/1.

Oxygen bonds are broken effectively between 185nm to 240 nm, evidence shows, if the substrate is oxygenated, light wave down to 150 nm, will not effect the PFC substrate. Oxygen absorbs, 100 percent of the UV radiation below 212 nm. Thus shield the PFC solution as well. The constraint is cost to build a powerful system. Things we can do to increase the intensity : increase the bulb pressure. Used pulsed waves and hit the natural harmonic frequency of the system .



# Constraints

- Ampoule containing fluid: 1cm diameter
- Bulb inner diameter must fit ampule plus electrodes:  
~2cm
- Must use below 212 nm wave length.
- Is not as efficient to use above this.
- (freq,volts, light intensity is to be determined experimentally ).
- Experiment to determine frequency for best dielectric breakdown, and to see if we can increase intensity, a peaking capacitor will help achieve this greater amperage for break down of gas.

# Ordering Parts

<u>Parts</u>	<u>Status</u>
Wave generator	Have
Amplifier	Have
Coil	Have
Peaking Capacitor	Have
Bulb & Gas Chamber	Contacted Manufacturer waiting
Aluminum Box for setup Conductive carbon nano film	Found a company Unidym.

# FDA classifications

- Quantel Medical
- 510(k) Summary
- Trade Name: 308 Excimer Lamp Phototherapy system
- Classification name: 878.4630 Ultraviolet lamp for dermatologic disorders.
- Regulatory Class: II
- PFC substrate is FDA approved as an image contrast agent class 3 505 (E), marketed by Alliance pharmaceutical.

# Status report

- After meeting with are sponsor, we honed in on potential problems, thus leading to enhanced PRD.
- Electrode design was a concern but solved with a carbon nano-tube conductive film made by UNIDYM.
- Complete dielectric break down was a concern, not enough amperage, solved with, peaking capacitor.
- Waiting for a response from the manufacture
- For bulb construction.



# References

- <http://icpig2007.ipp.cas.cz/files/download/cd-cko/ICPIG2007/pdf/3P15-03.pdf>
- <http://www.bio-oxy.com/home>
- <http://darinselby.1hwy.com/lungenema03.html>
- [http://www.access.gpo.gov/nara/cfr/waisidx\\_01/21cfr878\\_01.html](http://www.access.gpo.gov/nara/cfr/waisidx_01/21cfr878_01.html)
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