



## Presentation UV-Ozone!



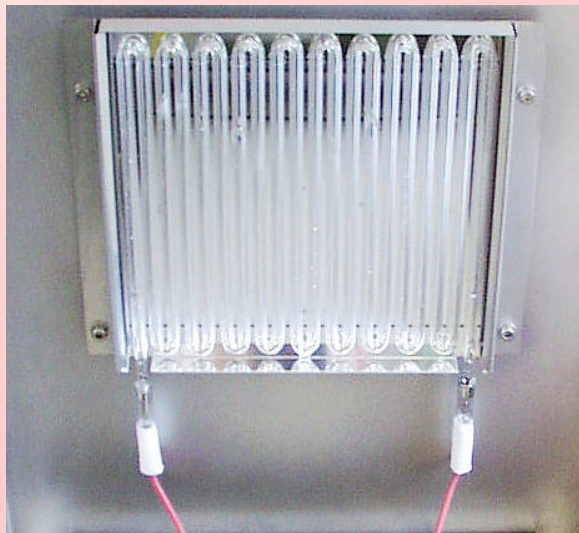
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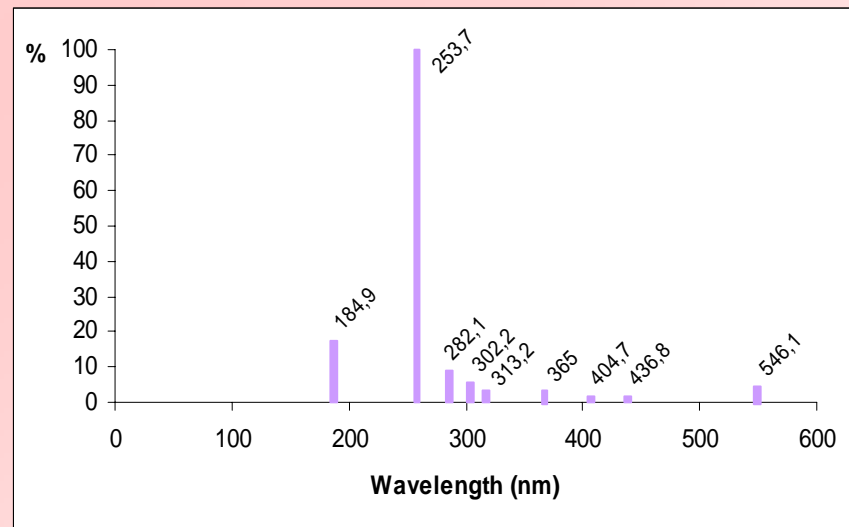
## 1. Principle of Cleaning by UV-Ozone

FHR is pioneering the application of UV-Ozone cleaning technology since 1995.

FHR is using Low Pressure Mercury Grid Lamps; actually the most economical way for small production and lab applications.

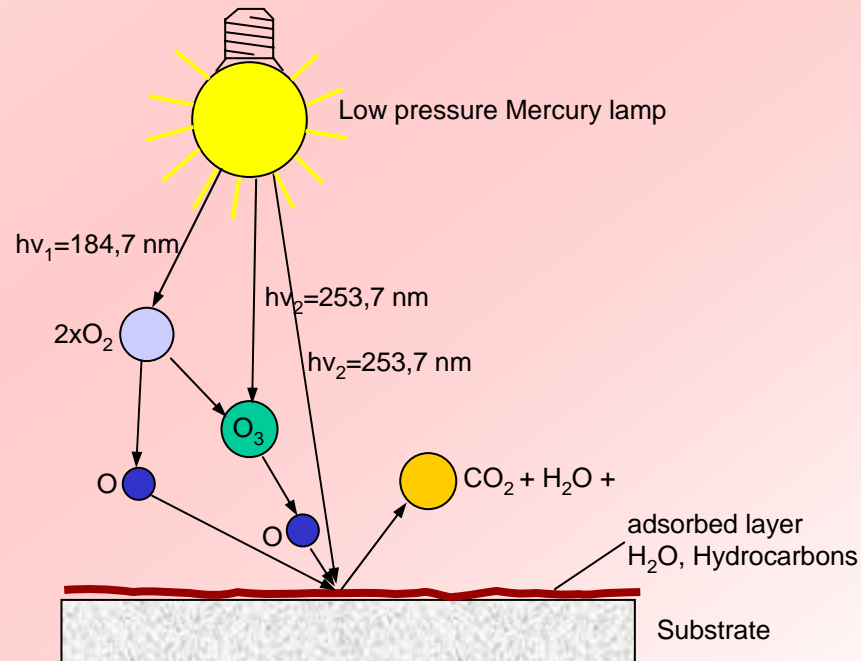


Grid lamp field



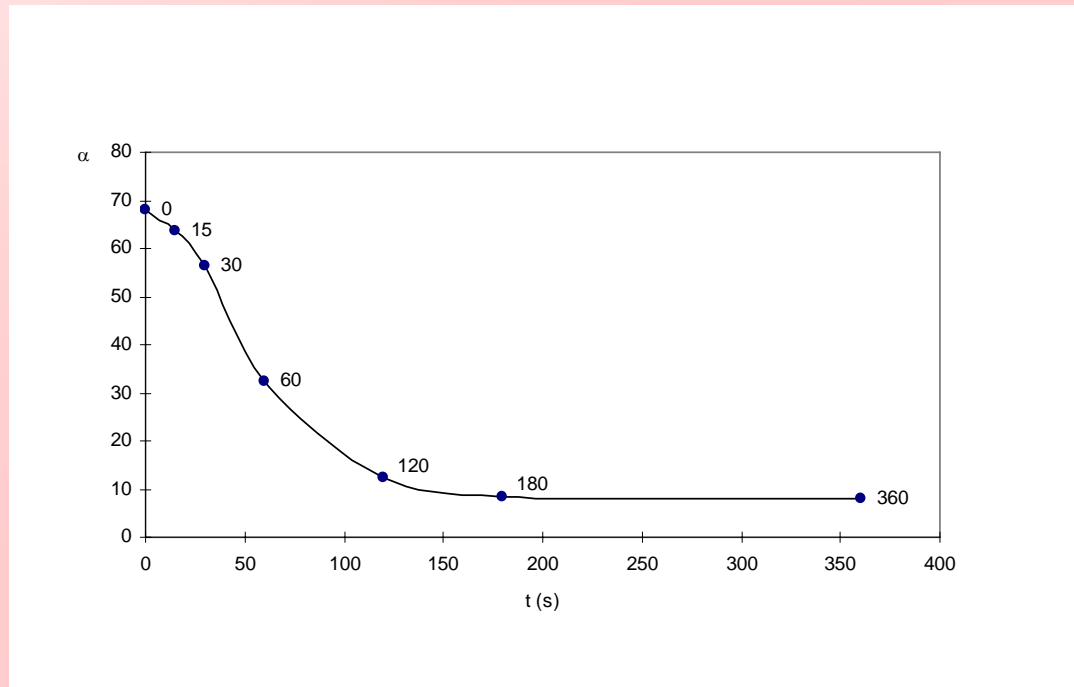
Optical spectrum of low pressure Mercury lamp

The cleaning effect is caused by irradiating the surface of a substrate with suitable lamps creating enough energy in the in the Ultra Violet spectrum range. It is photo-sensitized oxidation process by atomized Oxygen and high reactive Ozone. The UV radiation directly to the surface stimulates the reaction. Volatile hydrocarbon products are produced.



## 2. Effects to Different Surfaces by UV-Ozone Cleaning

- Removing of hydrocarbons with nm thickness by oxidation resulting in ultra clean surfaces with significantly wetability.

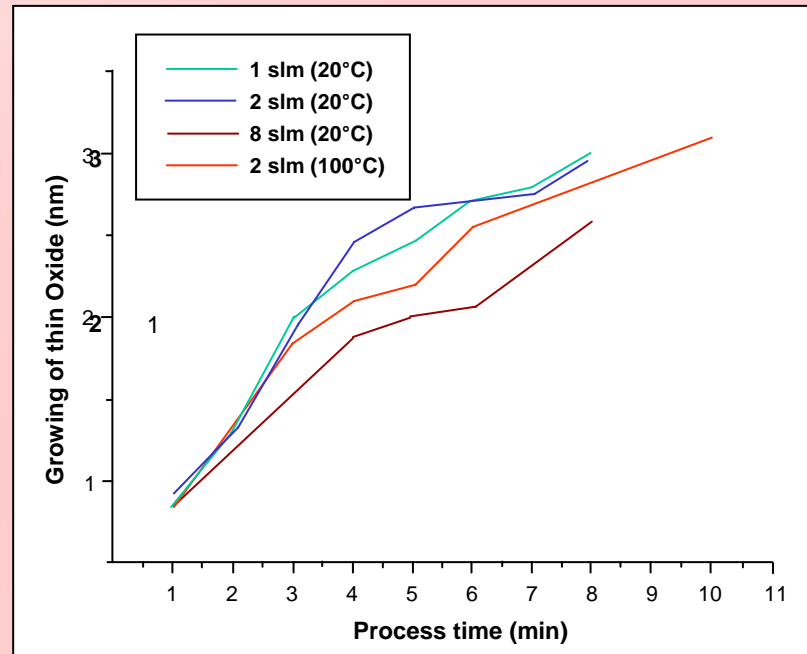


Reduction of contact angle (water) after UV-Ozone treatment for Si wafer depending from substrate condition

- Creation of an ultra thin oxide “protection” layer on semiconductor surfaces

Scheme: Growing of native oxide on GaAs surface.

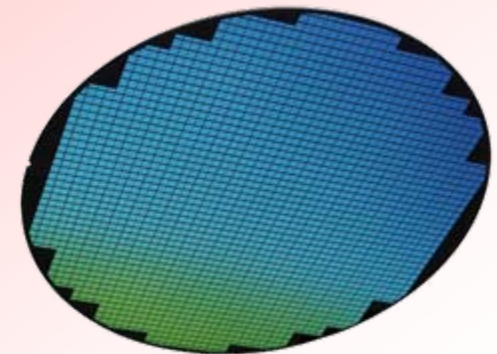
Source: Freiburger Compound Materials GmbH with UVOH 150



- Possible degradation of UV sensitive surfaces or components has to be considered !

## 3. Applications of UV-Ozone Cleaning

- Final cleaning of glass and ceramic substrates before thin film coating processes especially when ultra clean surfaces are needed → OLED, FPD
- Final cleaning of photo masks after resist stripping/ashing
- Final cleaning of bond pads of hybrid assemblies/ PCB's prior to wire-bonding processes
- Growing of ultra thin oxide films on semiconductor wafers
- Cleaning of wafers prior to oxidation and epitaxial processes
- Final cleaning of medical sensors or instruments
- Others



## 4. Equipment Provided by FHR

### UVOH 150 / 300\*

Substrate size: 170 mm x 170 mm x 10 mm max. /  
300 mm x 300 mm x 10 mm max.\*

Irradiation  
intensity: > 50 mW/cm<sup>2</sup>

Irradiation time: 1 sec ... 99 min 59 sec

Gas: O<sub>2</sub> gas line 114' VCR® with  
Rotameter  
0,1 ... 1,0 slm, max 2,5 bar

Exhaust: DN 40 KF, exhaust with 100 cfm  
required

Power: 220V AC , 50/60 Hz, 1000 W /  
1200W\*

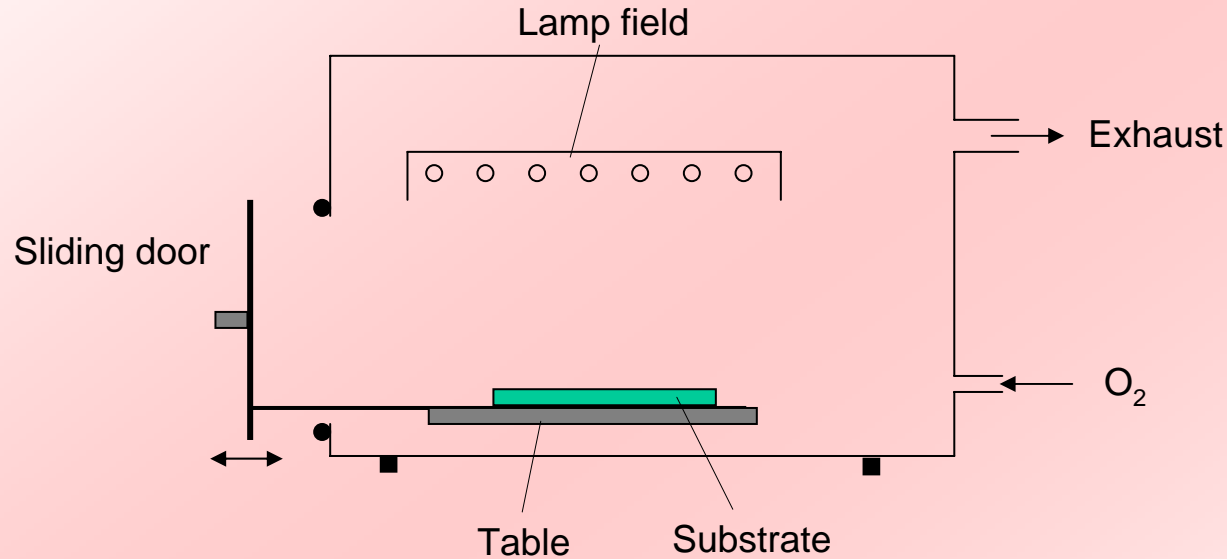
System  
dimensions: 520 mm (W) x 300 mm (H) x 420  
mm (D)

Weight: max. 35 kg / 85 kg\*

Options: heated table 25 ... 250 °C  
manual pin lift



## Principle Layout UVOH 150 / UVOH 300



### Advantage:

- simple design,
- competitive

### Disadvantage:

- automation unfavorable
- low productivity

## UVOH 150 LAB

Substrate size: 203 mm x 203 mm x 8 mm max.

Irradiation  
intensity: > 50 mW/cm<sup>2</sup>

Irradiation time: 1 sec ... 99 min 59 sec

Gas: O<sub>2</sub> gas line 114' VCR® with  
Rotameter  
0,1 ... 1,0 slm, max 2,5 bar

Exhaust: DN 40 KF, exhaust with 100 cfm  
required

Power 220V AC , 50/60 Hz, 250 W

System  
dimensions: 360 mm x 303 mm x 470 mm

WxHxD

Weight max. 26,5 kg



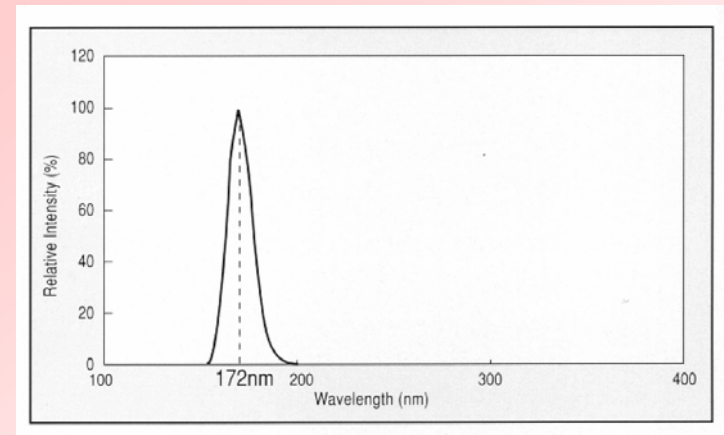
## 5. Future Equipment Developments by FHR

### 5.1. Utilization of Excimer Lamps

Excimer VUV lamps create an intensive radiation at 172 nm (Xe<sub>2</sub> Lamp). Due to the shorter wavelength the effectivity of cleaning is better and resulting process time is drastically lower compared to low pressure Mercury lamps. It requires however to work either in vacuum or with extremely low lamp substrate distance.

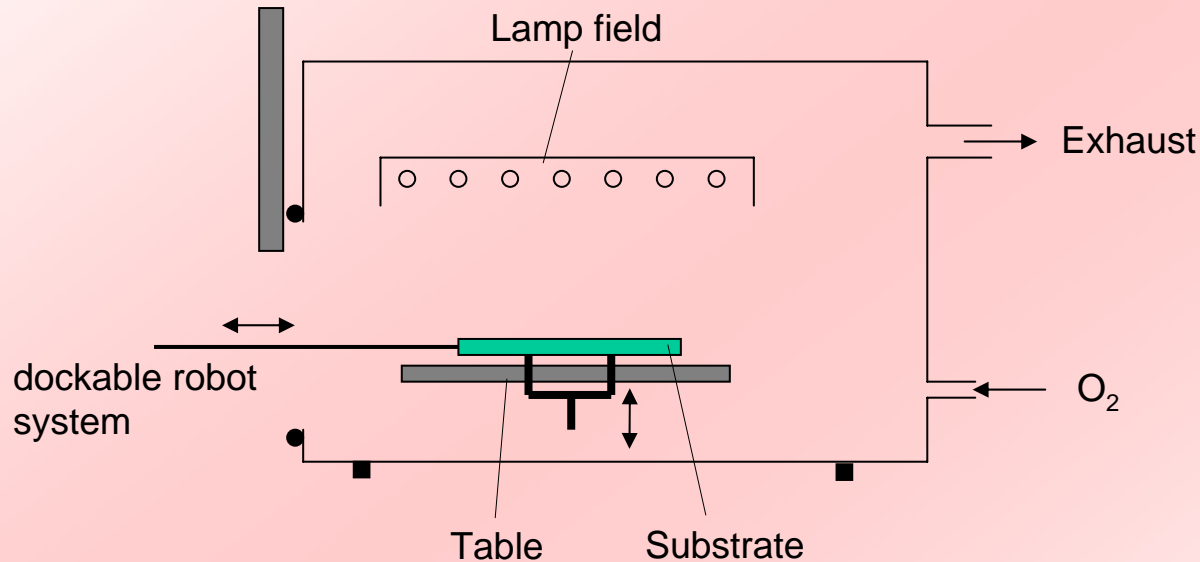
The cost of ownership is not in appropriate relation for laboratory use.

In case of high requested throughput for production purpose the utilization of Excimer lamps is definitely the solution.



***Ask FHR for a customized solution!***

## 5.2. Equipment Concept for Robot Handling



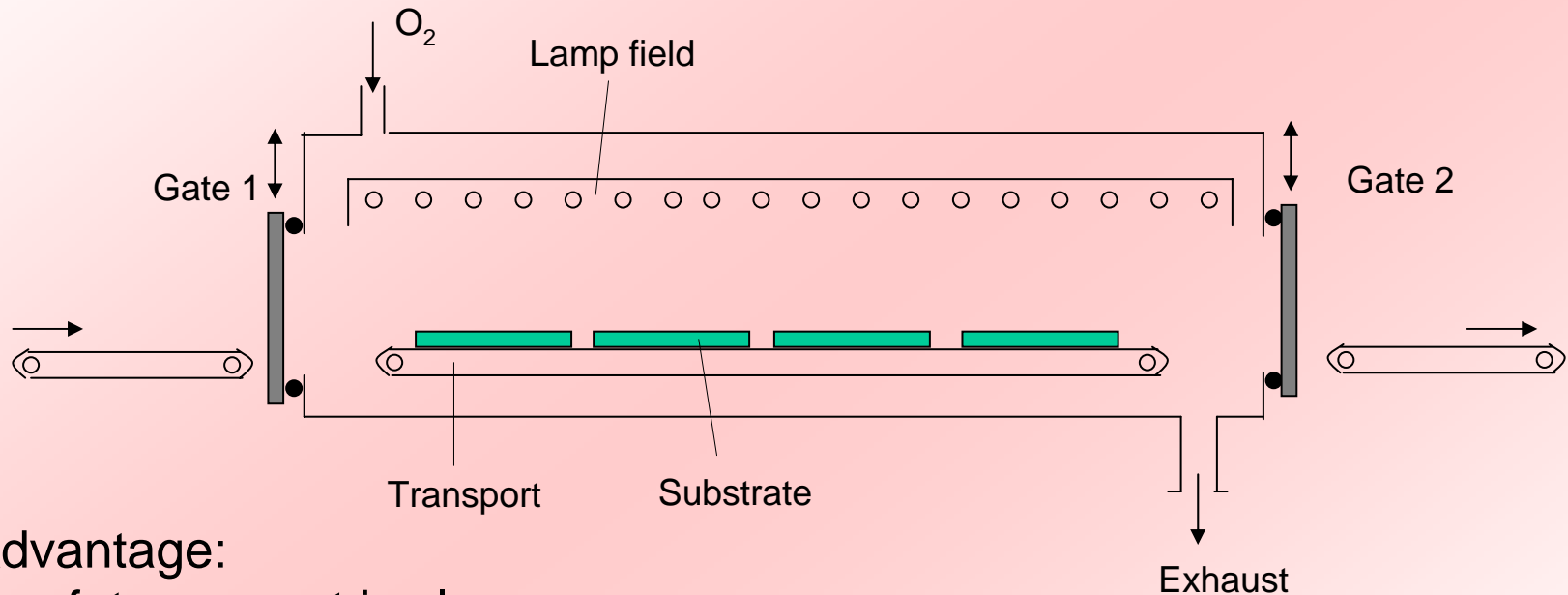
### Advantage:

- safety concept is clear
- automation good

### Disadvantage:

- medium productivity
- medium costs

## 5.3. Equipment Concept for Intermediate Substrate Flow



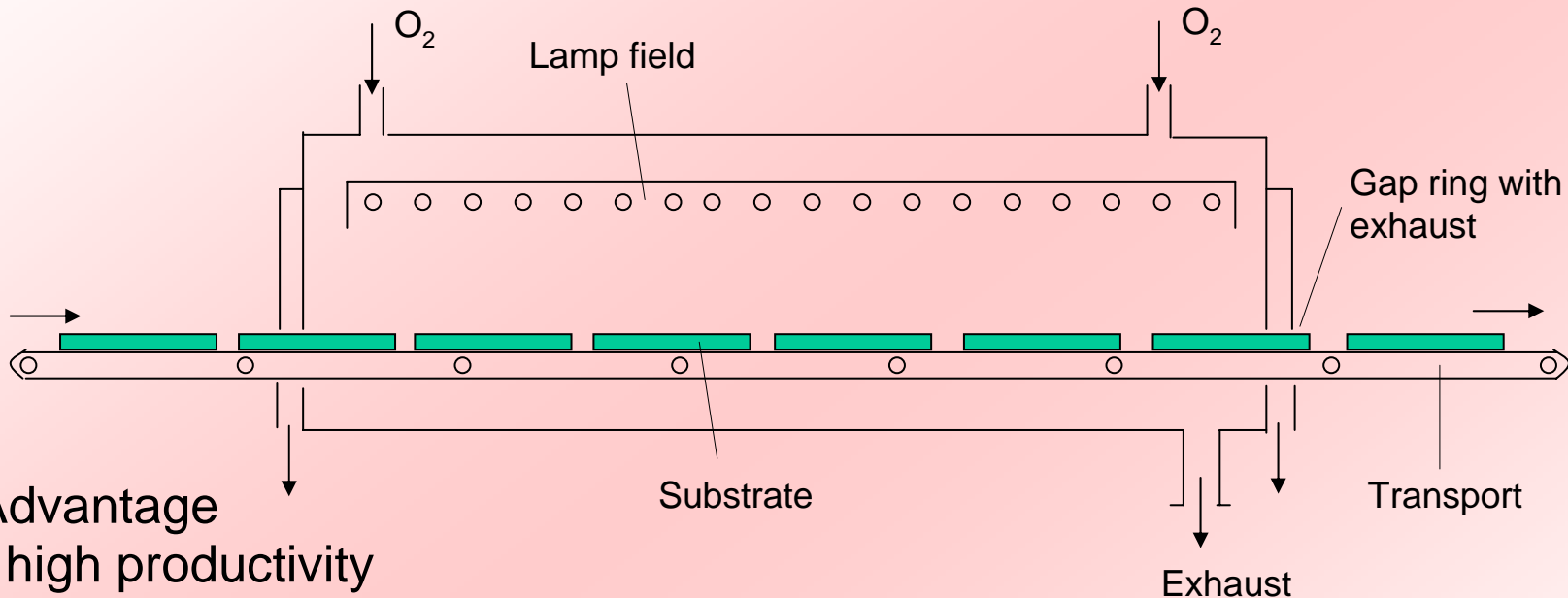
### Advantage:

- safety concept is clear
- automation good

### Disadvantage:

- medium productivity
- medium costs

## 5.4. Equipment Concept for Continuous Substrate Flow



### Advantage

- high productivity
- good coordination in manufacturing process
- automation good

### Disadvantage:

- safety concept has to reconceive
- high costs
- high gas usage

Problems: Safety, Ozone is toxic!  
Long half-life of Ozone!  
Corrosion may occur