



## UV-Ozone Cleaner

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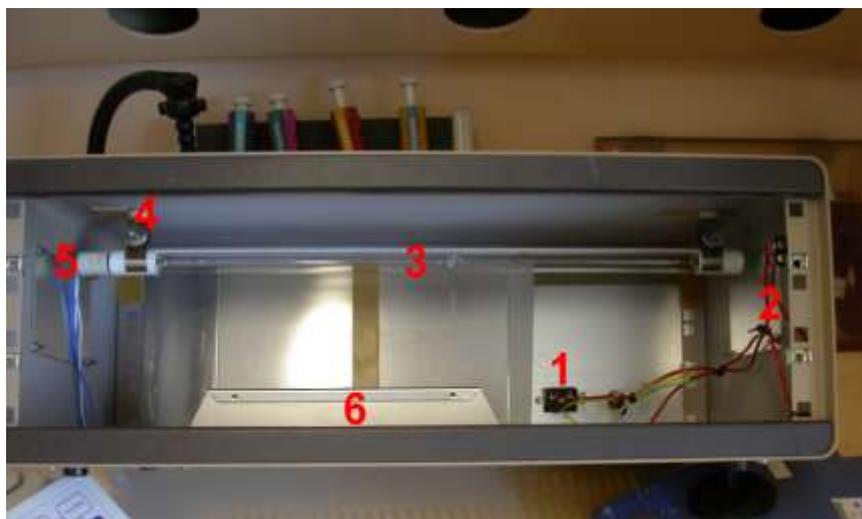
### Short abstract

This recipe describes how to build a cheap UV-Ozone cleaner used to cleanse/activate AFM cantilevers, mica, silicon wafers, glass/quartz, ceramics and metals before grafting chemicals.



### Step-by-step description of procedure(s)

1. Recycle the case of an old electronic device with the minimum size: L=500 mm \* W=300 mm \* H=200 mm. The original AC power outlet [1] should be preserved with its ON/OFF switch [2] (otherwise you have to plug/unplug the box each time). Nominal power supply is 230-250V, 45-65 Hz, with input current of 0.28-0.42 A (the lamp current is 1.5 A). The length of the box is important since the UV tube is about 450 mm long.
2. Attach the UV lamp [3] beneath the top of the box using two insulated ceramic connectors [4]. Leave some space on the left side of the lamp for the 4-pins cable [5] (see picture below)



3. The electrical ballast [6] is attached on the bottom of the box. Electrical cable connection map



is usually printed on the top of the ballast. The gap between the top of the ballast and the bottom of the UV lamp should be large enough to allow space for the sample tray.

4. Build a sliding ramp for the sample tray, if possible stainless-steel is better as it shows low level of corrosion (aluminium is also fine). Adjust the height so that the floor of the tray is about 1 cm below the UV lamp.



5. Place the UV-ozone cleaner box in a fume hood to reduce the risk of exposure to ozone. To use, place the sample on the aluminium tray (any glass support is acceptable) right below the lamp. See distance-time relation below. Then, turn on the UV lamp.



**Special comments:**



The principle of UV/Ozone cleaning is primarily the results of photosensitized oxidation process. Excited contaminant molecules and their free radicals produced by UV react with oxygen to form simpler volatile molecules: CO<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub>, etc.

The UV lamp used in this box has two wavelengths: 184 and 254 nm. The former is absorbed by oxygen to produce ozone, the later is absorbed by hydrocarbons and ozone (kills ozone).



Pre-cleaning is usually not necessary. However, if materials is very dirty, cleaning with ethyl alcohol (boiling, or ultrasound) combined with ultrasounds should be enough.



At a short distance from the UV lamp (< 1 cm), exposure of 30 sec is enough; the farther the sample from the lamp, the longer the cleaning time. At a distance of 10 cm, 30 min of UV light is necessary. Note that the lamp does not start immediately, add about 30 sec to the exposure time from the moment you turn on the UV lamp.



When cleaning metals, UV time is usually very short (< 1 min).

UV/Ozone cleaning targets all-kind of hydrocarbon molecules, thus do not deposit any kind of carbonated polymers beneath your sample to be cleaned.



Care should be made for UV: the UV lamp should be ENTIRELY shielded by the box container. No holes are allowed as UV causes severe eye injuries.



Care should be made for Ozone: Ozone is a toxic compound. Although the reference of the UV lamp used here possess a dual-tube UV source (one helps to generate ozone while the other is known to "kill" ozone), we suggest to place the UV-Ozone cleaner in a fume hood.

### Materials: purchased from UV-consulting Peschl

UV Lamp NIQ 60/35XL: Low pressure amalgam lamp, ozone generating (Product No.: 81057)

Ballast EVG 2x65-80/1,5A (Product No.: 80067)

4-pin plug ceramic (Product No.: 80026)

Approximate cost in 2013 = 480 € (w/o tax).

### References

Vig JR (1985) UV/Ozone cleaning of surfaces. *J. Vac. Sci. Technol. A* **3**: 1027-1034.