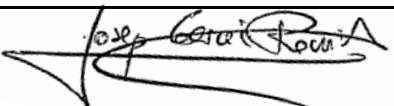




Test of remove effect Particle Matters, VOC's and formaldehyde by means of hydrogen peroxide and d-limonene



Experimental report

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Approval	Josep Garcia Raurich	

Place	Terrassa, Barcelona.
Experimental case	Experimental results for knowing the reduction of air pollutants and particles emitted by the burning of an incense stick over 2h exposition to a Wellis WADU-02 air purifier, using d-Limonene and H ₂ O ₂ cartridges in a volume controlled chamber.

1. Objective

The main objective of this report is to know the air purification potential of two devices, one that combines ozone and H₂O₂, and the second with d-Limonene in exposure time of 2h.

2. Introduction

The purification potential of the devices cited before, is already well known. The procedures done in this test were done to analyze the viability of a devices (Pict.1) that were supposed to purify and ensure a good air quality, liberating hydroxyl radicals (OH) that act rusting the different harmful particles present in the environment.



The reason why incense was chosen is because it is well known that it hires high quantity of harmful particles for human health, in respiratory system. This harmful air pollutant include formaldehyde, VOC (organic volatile compounds) and also particles whose size compreds PM 2.5, PM 1.0 and PM10.

3. Experimental procedure

For experimental procedure, it presented four different scenarios that allow the comparison and evaluation of the device's effectivity. All these procedures were done in a (6,6x 6 x 5,7) 225,72 m³ total volume chamber, burning a half a stick of incense. The result consists of 4 air quality readings, in the different times conditions cited below.

Air quality conditions, have been measured in a **first Control scenario** without any type of air purifying device, a **second scenario** with the presence of an air purifier with a hydrogen peroxide cartridge, a **third scenario** in this case, with a purifier air with D-limonene cartridge, the **fourth scenario** but this time with the presence of both air purifiers (D-limonene cartridges and hydrogen peroxide).

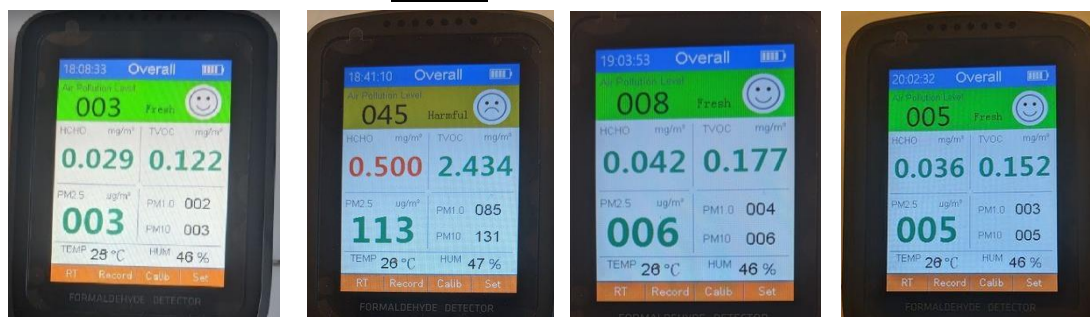
- The first readings determine the initial air quality in the room, without any exposure to incense or air purifiers.
- The second readings were taken 30 minutes after half of the incense stick was burned.
- The third readings were taken after 1 hour since half of the incense stick was burned.
- The fourth readings were taken after 2 hours from the half of the incense stick being burned.

Material and equipment
Incense
Cartridge d-Limonene Wellis WADU-02 air purifier
Formaldehyde detector IGERESS
Cartridge H ₂ O ₂ Wellis WADU-02 air purifier

4. Results

The results obtained were the following, according to the different purifiers used and the different conditions.

Control



Initial

30 minutes

1 hour

2 hours

Figure 1. Air quality taken in initial, 30 min, 1h and 2h respectively.

Hydrogen peroxide purifier

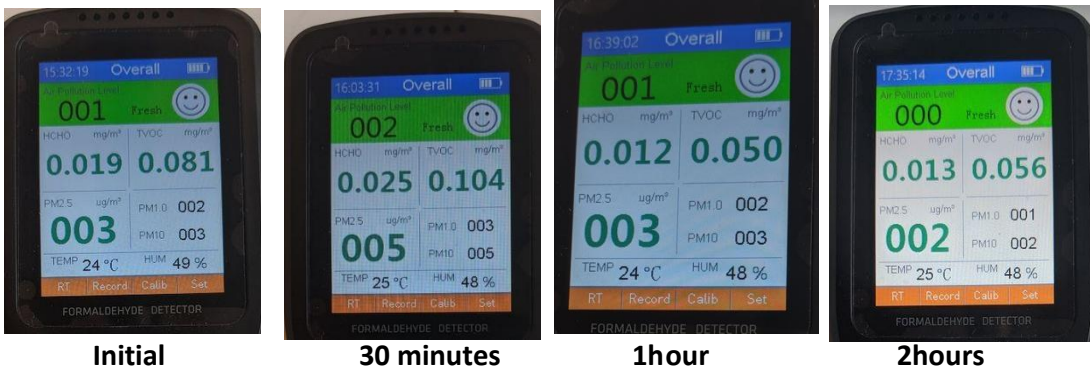


Figure 2. Air quality taken in initial, 30 min, 1h and 2h respectively.

d-Limonene purifier



Figure 3. Air quality taken in initial, 30 min, 1h and 2h respectively.

Both purifiers



Figure 4. Air quality taken in initial, 30 min, 1h and 2h respectively.

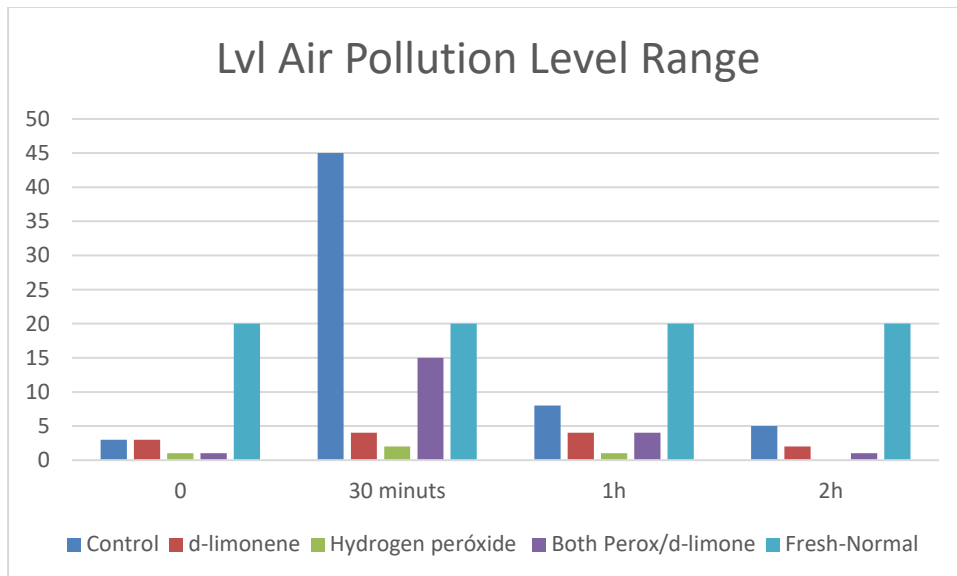
As it is shown, after 30 minutes, the control arrives to a nocive air quality. Then, after 1 hour, it turns to fresh quality, and finally, after two hours, the initial air quality was reached. This may be due to work in a large room where the emitted gases are easily dispersed through the environment.

If the control is compared with the H₂O₂ Wellis or D-Limonene Wellis, it can be seen fresh air status at 30 minutes from the beginning and it is maintained for the influence of the air purifier.

In the case of the two Wellis turned on at the same time, a worse air quality scenario can be seen, but not significantly and, after an hour, the air quality returns to the initial state.

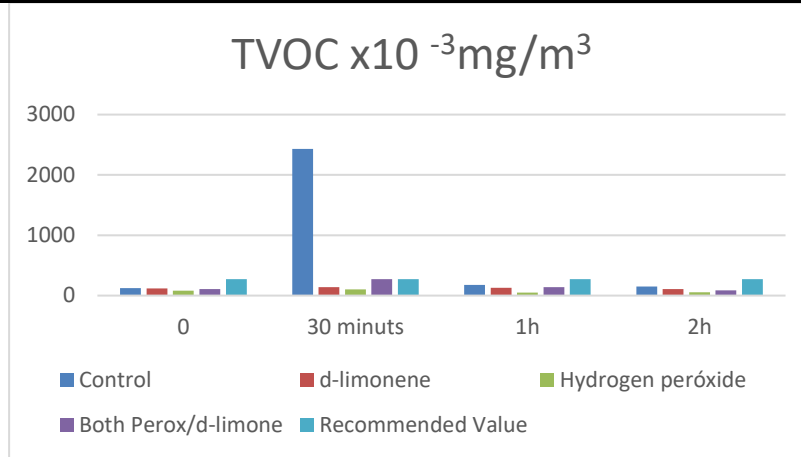
It is also shown that, between the H₂O₂ Wellis and D-Limonene Wellis, the H₂O₂ Wellis purifies the air better but with few significant differences.

Lvl	0	30 minuts	1h	2h
Control	3	45	8	5
d-limonene	3	4	4	2
Hydrogen peróxide	1	2	1	0
Both Perox/d-limone	1	15	4	1
Fresh-Normal	20	20	20	20

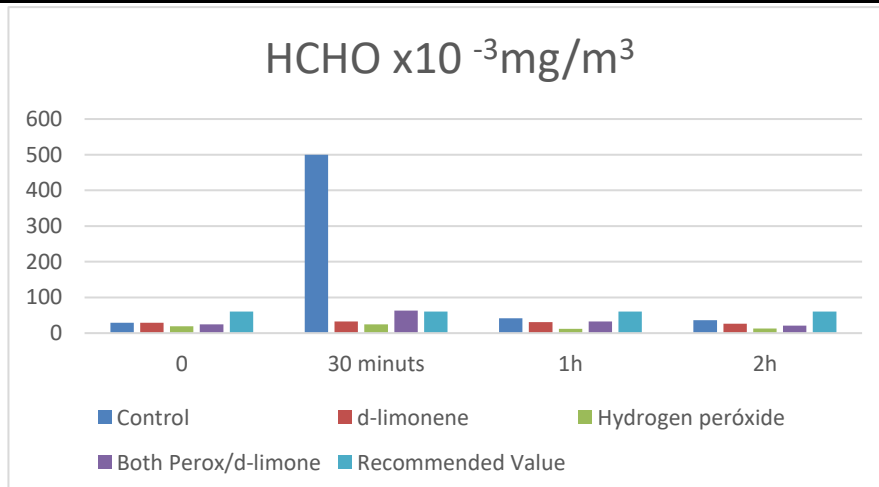


TVOC	0	30 minuts	1h	2h
Control	122	2432	177	152
d-limonene	121	139	128	107
Hydrogen peróxide	81	104	50	56
Both Perox/d-limone	107	272	141	86
Recommended Value	275	275	275	275

After 3 days TCOV* ≤ 10.000 µg/m³ After 28 days TCOV* ≤ 1.000 µg/m³ German Standard



HCHO	0	30 minuts	1h	2h
Control	29	500	42	36
d-limonene	29	33	31	26
Hydrogen peróxide	19	25	12	13
Both Perox/d-limone	25	63	33	21
Recommended Value	60	60	60	60
Limit German Standard	120mg/m ³			



5. Conclusion

To summarize, there are no experimental proofs that guarantees more efficiency in one Wellis device than the other with d-limonene or Peroxide cartridges.

So, the obtained values are not enough significant to confirm that H₂O₂ Wellis works better than D-Limonene Wellis. The two devices allow a correct purification of the atmosphere, being effective purifiers with incense presence.

In any case, separately, in the device with peroxide and the d-limonene device a significant measurable activity can be seen against the harmful compounds of the burning of incense.

In any case it is remarkable the activity of devices in order to reduce the harmful compounds inside polluted place.

