

Needlepoint Bipolar Ionization is NOT Corona Discharge Ionization

There is much confusion surrounding air purification technologies, specifically needlepoint bipolar ionization and corona discharge ionization. Needlepoint bipolar ionization systems (NPBI) is not the same as corona discharge ionization systems.

Corona discharge systems have been operating since the late 1800's and were originally developed by Sir William Crooks; consequently, they were marketed as the "Crooks Tube" and at times called a cathode ray tube. The technology nomenclature was later changed to the "plasma tube" by William Langmuir around 1928. Corona discharge products have been in the market for quite a long time. They are also marketed as corona discharge tubes (CDT) or dielectric barrier discharge (DBD) systems. Many companies use CDT/DBD to generate ozone for various odor control applications. The fact of the matter is, if you use corona CDT/DBD technology, there will be ozone as a byproduct.

Referring to Figure 1, you can see that on a corona discharge tube, there is an inner filament, glass and an outer filament.

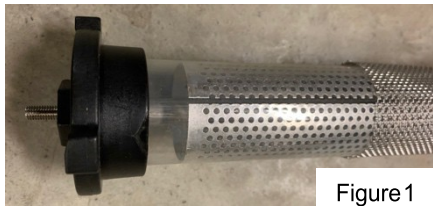


Figure 1

The glass is the "dielectric" or resistance to the voltage path to ground. The dielectric can be glass, quartz, mica, ceramic, or any other material that has a high dielectric (insulating) value. In order for a corona discharge system to operate, the voltage and current have to be high enough to break down the dielectric material, in order to complete the electrical path to ground. When the power output is sufficiently high and the path to ground is achieved due to

the dielectric breakdown, a corona discharge is formed. The corona discharge is best seen in total darkness and it appears as a purple glow down the entire tube.

CHEMICAL	FORMULA	Electron Volt
Xylene*	C_8H_{10}	7.89
Styrene*	C_8H_8	8.46
Methyl Ethyl Ketone*	C_5H_8O	9.52
Ammonia*	NH_3	10.07
Acetaldehyde*	CH_3CHO	10.23
Ethyl Alcohol*	C_2H_5OH	10.48
Formaldehyde*	CH_2O	10.88
Oxygen	O_2	12.07
Glass tubes require >12.07 to break down the dielectric		



The power required to make most dielectrics break down exceeds 12.07eV (electron volts). Oxygen has an electron volt potential of 12.07eV, and when the power input is greater than 12.07eV, ozone is created due to oxygen being ionized or "activated". Every gas in our atmosphere has an electron volt potential. Understanding the power relationship to eV is critical when designing air purification systems and preventing the formation of ozone. Needlepoint bipolar ionization is uniquely different from corona discharge systems. NPBI does not use a dielectric; therefore, the power output can be controlled to less than 12.07eV and prevent the formation of ozone. NPBI technology has been certified by UL 867 and UL 2998 as an ozone free technology; therefore, ozone, aldehydes and ultra-fine particles are not created. In fact, NPBI is used by multiple cleanroom manufacturers to reduce ultra-fine particles. NPBI has been successfully used in hospitals, offices, airports, schools, arenas, airplanes, veterinary offices and vivariums, to name a few applications.

- * Typical contaminants of concern as contained within ASHRAE 62.1
- Electron Volt Energy greater than 12eV, creates ozone (O_3)

Figure 2 CORONA DISCHARGE TUBE

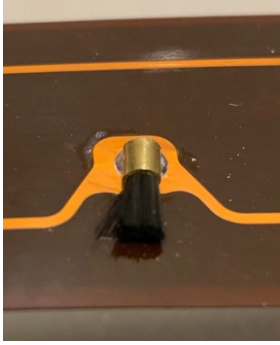


Figure 3

NPBI electrodes or “needles” can be made from carbon fiber (see Figure 3), titanium, silver, gold, stainless, or any other corrosion resistant, conductive material. As you can see from the Figure 3, the electrodes are attached to the flexible circuit and there is no dielectric.

NPBI has been used for particle reduction, odor control, pathogen control and static electricity control for more than 10 years. When applied properly, the issues associated with corona discharge or dielectric barrier discharge systems can be avoided. The newer needlepoint bipolar ionization technologies should not be considered the same, or even similar, to corona discharge systems.