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# BI-POLAR IONIZATION

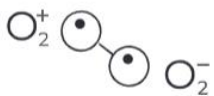
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**Bi-polar ionization** is a process in which positive and negative ions, when generated in adequate quantities and delivered by injecting them into HVAC supply air, react with water vapor and break down pathogens, allergens, particles, smoke, odors, and VOCs (Volatile Organic Compounds). If appropriately

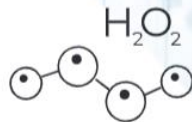
designed, bi-polar ionization systems treat the space where people are most affected, not just the ductwork or HVAC components. By breaking down and removing those components in the air, the environment where people work and live becomes safer and healthier.



## Science Behind Patented Technology



Patented bipolar ionization technology that generates O<sub>2</sub><sup>+</sup> and O<sub>2</sub><sup>-</sup> ions at high density



These O<sub>2</sub><sup>+</sup> and O<sub>2</sub><sup>-</sup> ions combine with moisture in the air (H<sub>2</sub>O) to create H<sub>2</sub>O<sub>2</sub>, hydrogen peroxide



Once airborne, the hydrogen peroxide clusters around harmful pathogens both in the air and on surfaces



Upon contact, the hydrogen peroxide destroys the protective protein structure of the pathogens, rendering them harmless

Noble Associates Inc.

**Bi-polar ionization** means that the ions are generated using two emitters to create equal amounts of positively and negatively charged ions. When these ions are injected into the air stream, they create a plasma region and break down passing pollutants and gases into harmless compounds like oxygen, carbon dioxide, nitrogen, and water vapor. When these ions meet viruses, bacteria, or mold, they remove the hydrogen molecules from the pathogens. Without hydrogen, the pathogens have no source of energy and die. The ions also attach to allergens such as pollen, smoke, and other particles, causing them to band together until they are large enough to be filtered out of the air or fall to surfaces where they will be removed in cleaning.

## Proven Technology

| Substance | Substance Name                | Testing Organization            | Removal |
|-----------|-------------------------------|---------------------------------|---------|
| Bacteria* | Escherichia Coli*             | EMSL Analytical, USA            | 99%     |
|           | Escherichia Coli ATCC*        | Istanbul University, Turkey     | 91%     |
|           | Staphylococcus Aureus*        | EMSL Analytical, USA            | 91%     |
|           | Pseudomonas Aeruginosa*       | Istanbul University, Turkey     | 99%     |
|           | Staphylococcus Aureus (MRSA)* | EMSL Analytical, USA            | 99%     |
| Fungi*    | Aspergillus Niger*            | EMSL Analytical, USA            | 97%     |
|           | Dichobotrys Abundans*         | Prof. Joe F. Boatman, USA       | 90%     |
|           | Penicillium*                  | Prof. Joe F. Boatman, USA       | 95%     |
| Mold*     | Cladosporium Cladosporioides* | EMSL Analytical, USA            | 97%     |
| Spores*   | Bacillus Subtilis Var Niger * | Istanbul University, Turkey     | 89%     |
| Viruses*  | Influenza H1N1 *              | Kitasato Research Center, Japan | 99%     |
|           | Influenza H5N1*               | Kitasato University, Thailand   | 99%     |
|           | SARS-COV-2 (COVID-19)*        | University of Patras, Greece    | 99.9%   |
|           | SARS-COV-2 (COVID-19)*        | Innovative BioAnalysis, USA     | 99.998% |

In a lab setting\*