EnviroKlenz™

Personal Environmental Protection For Everyone

EnviroKlenz Mobile Air System, 250 CFM
w/ Air Cartridge & HEPA Filter

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Chemical Triggers & Environmental Related Illnesses

Chemicals enter the body in many different ways, food, drugs, skin exposure, but we are constantly breathing and inhaling whatever is in our immediate environment through the air. Any harmful chemical that enters the body has to be eliminated. This process is carried out by a range of biological pathways and organ systems in the body. Some believe that chemical sensitivity develops when these body functions cannot keep up with the demand or are functioning improperly.

Chemical sensitivity appears to develop in individuals who are prone to have the more traditional allergies or have asthma, eczema, or other related conditions and are very sensitive to a wide range of chemical stimuli. Even strong smells may cause respiratory problems for an individual when they are dealing with an environmental illness.

Headaches from perfumes, nausea from paint smells, and dizziness or lightheadedness from chemical odors can be some of the early signs and symptoms for someone who overtime develops a more serious chemical sensitivity. In some instances, multiple chemical sensitivity (MCS) appears after an acute exposure to a high level of a particular chemical which then appears to "spread" to other related chemicals as triggers.

Unfortunately the true mechanism of chemical sensitivity is not known, but the effects for individuals dealing with symptoms are very real. The ability of the body to detoxify and get rid of chemicals, combined with an increased sensitivity to the effects of these chemicals on the body is difficult to manage and can often become debilitating. Many individuals turn to detoxification methods and limiting exposure as ways to cope with their environment.

Timilon shares the belief that limiting exposure is one of the best strategies for an individual with environmental illness and chemical sensitivities. We are constantly breathing and the world around us is full of chemical pollution, odors, and fragrances. Individuals can make choices for the foods, medicines, and other things they ingest, but it is much more challenging to choose what is in the air we are breathing. Air filtration devices do a great job of removing particulate matter, but chemicals and odors are not easily caught by sized-based filtration technology.

Timilon believes the best methods, products, and technologies should offer the ability to chemically dismantle a wide range of undesirable chemical compounds in addition to the particulates. Compounds such as fragrances, chemical smoke, volatile organic compounds (VOC), and pesticides, just to name a few, are all comprised of a wide range of chemicals that are not trapped or broken down by traditional filtration technology.

About EnviroKlenz

The creation of EnviroKlenz® was inspired by our Customers with multiple chemical sensitivities and environmental illnesses. We have been honored to be able to work closely with them and learn from their experience and feedback. Through their recommendations we were able to introduce a product line that is both effective and safe for everyone—especially those with illnesses triggered by environmental exposures.

We have worked vigorously and diligently to test our products with MCS influencers and support groups to provide "Personal Environmental Protection for Everyone." We look forward to continuing our work with those affected by Multiple Chemical Sensitivities, to provide resources and products that will help overcome the challenges of living in our toxic world.

The EnviroKlenz program is a process that addresses odors and chemical contamination in air space, surfaces, and on contents through a variety of products to collectively create a clean air environment.

Each EnviroKlenz product is made from various combinations of our proprietary metal oxides powders. These earth mineral powders include our proprietary NanoActive® Magnesium Oxide (MgO), Zinc Oxide (ZnO), and Titanium Dioxide (TiO_2) materials. We combine them to achieve the right balance of active components to suit the desired application.

The EnviroKlenz® Mobile Air System improves your personal environment air quality by removing chemical odors, fragrances, VOCs, particulates, and allergens all in one process. The patented EnviroKlenz technology neutralizes chemicals, pollutants, and fragrances, while the high-efficiency particulate air (HEPA) filter removes harmful dust, particulate, allergens, pet dander, and more.

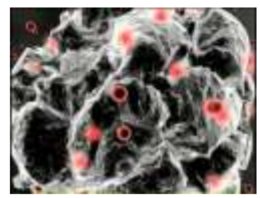
The process utilizes EnviroKlenz technology in the multistage filtration treatment to adsorb, neutralize, and eliminate chemical pollutants coming from a broad array of sources while removing airborne particles such as dust and miscellaneous debris to improve indoor air quality. The processor moves air through a polyester filter pad, an EnviroKlenz Air Cartridge, followed by HEPA filtration. What makes the total process unique is the use of the EnviroKlenz advanced chemical treatment technology for the control of odor causing molecules and a broad array of hazardous indoor pollutants.

About The Technology

The EnviroKlenz® products use our nanotechnology called NanoActive that makes them very effective for chemical neutralization and odor elimination. However the materials are NOT nanoparticles.

The term "nano" can mean different things and can be applied to many fields of science, technology, and research. Generally it refers to technologies that deal with the special properties of things or matter that are sized below 100 nm in 2 or 3 dimensions. As materials get smaller, many different physical and chemical phenomena become pronounced. One example is that as the size of the materials decrease, the chemical reactivity or kinetics of reaction typically increase. In the case of odor neutralization that would mean faster and more complete elimination of the odor. A potential drawback, however, is as materials get smaller in size they could potentially pose a safety concern due to the small size of the particles.

What makes the NanoActive technology special is that the benefits of the more effective chemical neutralization are derived without the concerns associated with small nanoparticles. In fact our particles are many times larger than traditional nanoparticles.



You are probably wondering how this is achieved? The EnviroKlenz technology adsorbs and eliminates toxic and noxious chemicals by a combination of both physical and chemisorption mechanisms. The advanced high surface area chemistry of the EnviroKlenz neutralizing agents, in combination with the high chemical neutralizing reactivity provides superior chemical neutralization and odor elimination. This desired outcome is achieved by our advanced technology while retaining the safety characteristics of the basic earth minerals.

We have trade secret and patented processes in which we can produce our NanoActive metal oxide materials (which are inherently safe) and increase the usable surface area and pore volume. These increases allow the whole volume of the materials to be for chemical neutralization and not just the outside surface. Thus we get the full activity of the nanomaterials, without being a nanoparticle.

These unique and advanced manufacturing approaches greatly enhance the ***beneficial neutralizing properties*** of the earth minerals by turning them into an active form while retaining their inherent safety characteristics. When EnviroKlenz compounds come into contact with harmful chemicals and vapors, the earth minerals' receptors capture the bad chemicals. The manufacturing techniques are designed to facilitate, enhance, and add to that process. EnviroKlenz's earth minerals more efficiently capture and destroy the harmful chemical through a process we call "***adsorptive neutralization***."

EnviroKlenz has increased surface area, unique morphology, high chemical reactivity, and high porosity, all contributing to the enhanced adsorption and neutralizing characteristics. EnviroKlenz has the ability to not only contain, but to also chemically break down a wide variety of chemical compounds. This technology has been tested and certified for a broad array of chemical pollution mitigation including the highly toxic chemical warfare agents. The technology has been tested by the following laboratories for chemical breakdown and neutralization applications:
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- Battelle Memorial Institute
- Edgewood Chemical Biological Command
- Coal Mines Technical Services
- Organization for the Prohibition of Chemical Weapons (OPCW)

Additionally, the technology had gone thought the Lloyds Register Product Verification Scheme for its ability to decontaminate airborne chemical contamination from enclosed spaces:

- Certificate PVS 1400001, dated June 17, 2014

For a product to be effective at minimizing triggers for individuals afflicted with MCS, a broad range of chemistries should be able to be reduced and/or neutralized ***while simultaneously not introducing any new chemical triggers***. This is why the active components that comprise EnviroKlenz products were selected from those that are not only effective, but have been proven safe through oral, pulmonary, ocular, and dermal toxicology testing conducted by leading independent certified laboratories:

- U.S. Army Center for Health Promotion and Preventative Medicine
- MPI Research
- Nelson Laboratories, Inc.

The deployment method of the technology is also key as the chemical contaminates must come into contact with the adsorptive neutralizing material. Air moving systems provide an efficient mechanical mechanism to do this without the introduction of additional chemical pollutants. Timilon's combination of adsorptive neutralization and mechanical filtration has been awarded a U.S. patent:

- **8,496,735** Method and apparatus for control and elimination of undesirable substances. The patent describes the system (apparatus and method) for eliminating undesirable air-borne substances including a blower, air filtration cartridge using Timilon's metal oxides technology and fibrous filtration media.

Additional select U.S. patents Timilon has in this area of research and development include:

- **6,653,519** Reactive nanoparticles as destructive adsorbents for biological and chemical contamination
- **7,276,640** Metal oxide nanoparticles for smoke clearing and fire suppression
- **7,566,393** Method of sorbing sulfur compounds using mesoporous metal oxides
- **8,038,935** Treatment of odors using nanocrystalline metal oxides
- **9,039,817** Multilayered mixed bed filter for the removal of toxic gases from air streams and methods thereof
- **9,095,838** Adsorbent for removal of ammonia from air streams

The EnviroKlenz® Process Overview

The EnviroKlenz® Process is the scientifically and field proven choice for the safe, rapid, convenient, and cost-effective restoration of indoor spaces from toxic and irritating chemical air pollutants.

The EnviroKlenz core chemistry (the "Product") irreversibly captures and neutralizes a broad range of indoor air pollutants. EnviroKlenz works by *"adsorptive neutralization."* As EnviroKlenz comes in contact with chemical pollutants in circulating air or on surfaces of materials, the Product's chemistry 1) irreversibly attaches to and reacts with the pollutants, and 2) destroys/neutralizes the pollutant. The irreversible result is a benign, environmentally safe byproduct and elimination of the unpleasant and potentially dangerous pollutants.

To be effective, the Product must:

(i) come into contact with the chemical pollutants in the air or on surface(s) within the enclosed residential, commercial, or mobile space,
(ii) be positioned to permit its contact at an air flow rate, contact time, treatment schedule, temperature, humidity, and/or concentration, as prescribed for the specific application, and
(iii) be deployed in accordance with instructions detailed in the EnviroKlenz User Guide and/or instruction sheet, and other Product labeling.

EnviroKlenz has been tested and proven effective against a broad spectrum of hazardous chemicals and volatile organic chemicals (VOCs). When used as directed, EnviroKlenz will irreversibly adsorb and/or destroy the following chemical compounds:

Table 1: Partial list of common compounds that can be successfully removed/neutralized by Timilon's EnviroKlenz technology.

Acids	Phosphorus/Sulfur Compounds	Organic Compounds
Hydrochloric Acid	2-Chloroethyl ethyl sulfide	Acetaldehyde
Hydrofluoric Acid	Dimethyl methyl phosphonate	Formaldehyde
Nitric Acid	Paraoxon	p-Cresol
Phosphoric Acid	Parathion	Diesel
Sulfuric Acid	Methyl Mercaptan	Denatured Ethanol
Muriatic Acid	Miscellaneous Pesticides	Acetone
Caustic/Acidic Gasses	**Solvents**	Ethylene Oxide
Anhydrous Ammonia	Acetonitrile	4-Vinylpyridine
Chlorine	Chloroacetyl Chloride	Methanol
Hydrogen Chloride	Acetyl Chloride	Toluene
Nitrogen Dioxide	**Other**	Adhesives
Sulfur Dioxide	Body Odors	Cleaning Chemicals
Hydrogen Sulfide	Perfumes/Fragrances	Scented Products

Air Filtration Overview

Removal of hazardous pollutants from air is an important application area with significant impact on human health and quality of life. Portable home air filters, personal protection respirators, and large scale filtration systems installed in buildings are examples of air filtration products widely used to improve air quality and prevent exposure to harmful pollutants. Air filters removing chemical pollutants, gases, or vapors, are frequently used in facilities using toxic chemicals or in buildings where such pollutants may be present.

The majority of air systems only focus on particle filtration. These devices may use a combination of traditional Minimum Efficiency Reporting Value (MERV) rated filters and high-efficiency particulate air (HEPA) filtration. Some devices add in solid sorbents, most commonly carbons, which capture air pollutants by means of physical absorption. Such filters have only limited removal capacities and often no destructive capabilities resulting in the odor chemical contaminates being released back into the environment which is a major drawback of traditional carbon-based filtration systems and the main factor limiting their wider applications effectiveness.

Comparison to Carbon

Carbon is a commonly used material in odor control applications. It absorbs odors; however it does have several serious disadvantages. Most significantly, carbon only physisorbs toxic, noxious, and other odor causing molecules, meaning that the unwanted chemicals do not react chemically with the carbon and can be released them later and cause the re-emergence of an odor believed to have been initially neutralized or eliminated. Changes in humidity or temperature can hasten this process, causing the odors and other unwanted chemicals to be released back into the air.

Multiple studies exposing NanoActive metal oxides and carbon compounds to common odor-causing chemicals through breakthrough and packed bed reactors have been conducted. These included exposure at ambient conditions with variable vapor and gaseous chemicals of different classes including acids, bases, organics, and noxious chemicals.

The filtration capabilities of NanoActive metal oxides were compared to carbons where the chemically exposed solids were heated and the identities of the evolved vapors were determined by infrared spectroscopy. The process of heating the sample accelerates the off gassing (or release) of the chemical if it is not chemically broken-down or bonded to the media. Table 2 illustrates the desorption results carbon has with a variety of chemical classes in comparison to NanoActive materials. NanoActive materials can be combined, blended, and added to other compounds to increase or optimize efficacy against a particular chemical or odor.

Table 2: Comparisons of Agent Desorption/Offgassing Properties of NanoActive and Carbon Media.

Chemical Agent	Comments
Acetaldehyde	NanoActive metal oxides outperformed carbons in capacity and showed no signs of off gassing. Carbon desorbed (released) neat acetaldehyde agent.
Hydrogen Sulfide	Carbon released neat H_2S agent starting at relatively low temperature (60-100 ˚C). NanoActive ZnO does not exhibit H_2S desorption.
Hydrogen Chloride	Carbons released neat HCl agent starting at very low temperature (50-80˚C). NanoActive ZnO does not exhibit HCl desorption.

NO_x	Carbon released NO_2 at 90-120 °C. NanoActive TiO_2 releases NO_2 at 170 °C while NanoActive MgO does not release NO_2.
Furan	Carbon released furan at low temperatures (50-85°C) while furan is not released from NanoActive metal oxides.
Methyl Mercaptan	Carbon released methyl mercaptan at 110 °C from humidity-exposed samples, while no methyl mercaptan is released from the NanoActive metal oxides.
Carbon Disulfide	Carbon released CS_2 at 60 °C, while NanoActive metal oxides do not.
Sulfur Dioxide	Carbon released SO_2 at 170 °C while NanoActive metal oxides do not.
Ammonia	Carbon released NH_3 at 50 °C while NanoActive MgO does not.
Ethylene Oxide	Carbon released ethylene oxide at 60 °C while NanoActive TiO_2 and MgO do not release any ethylene oxide.
DMMP (phosphorous containing agent)	Carbon released DMMP at 120 °C while NanoActive TiO_2 does not.
2-CEES (sulfur and chlorine containing agent)	Carbon released CEES at 78 °C while NanoActive TiO_2 does not.

In Table 3, breakthrough studies were done to compare common carbons to NanoActive TiO_2 against ammonia. A 31% increase in absorption capacity was observed over the URC carbon. The carbon samples also exhibit desorption of ammonia, where NanoActive metal oxides do not, indicating the chemical interactions between the chemical agent and the NanoActive materials is much stronger.

Table 3: Breakthrough Times for Ammonia.

Sorbent	Breakthrough time against ammonia (min) at 25% RH	Improvement over Carbon (URC)
Virgin granular activated carbon	6	-
Carbon (URC)	35	-
NanoActive TiO_2	46	31%

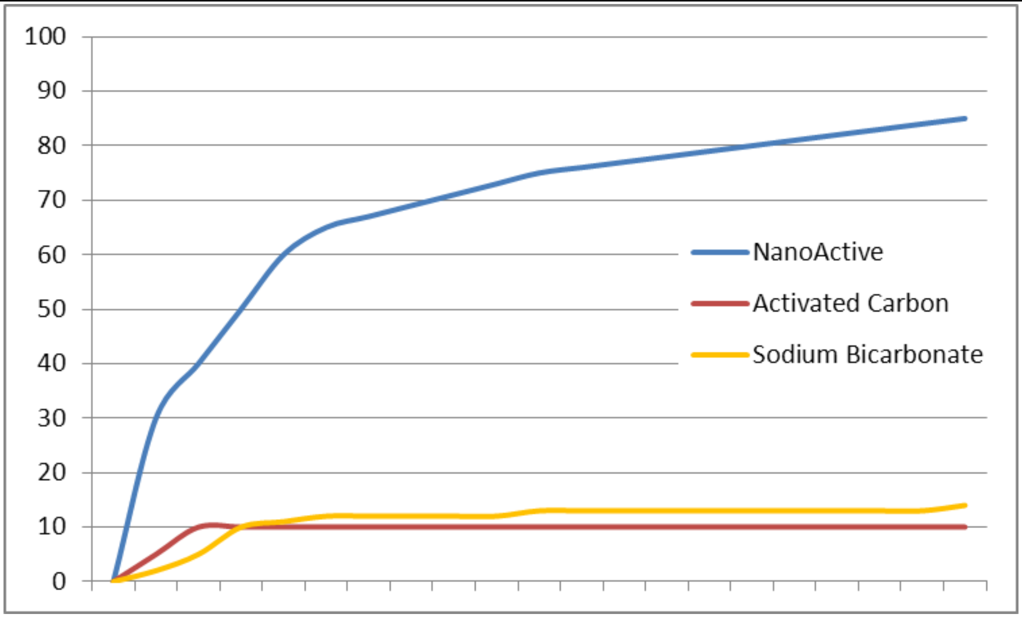
In Table 4, breakthrough studies were done to compare common carbons to NanoActive MgO against sulfur dioxide. Sulfur dioxide is a toxic gas with a pungent, irritating, and rotten smell. It is a common air pollutant that can have significant negative impacts upon human health. A 72% increase in absorption capacity was observed over the URC carbon. The virgin granular activated carbon was not able to absorb sulfur dioxide. The carbon samples also exhibit desorption of sulfur dioxide illustrating the mechanism is only physical, whereas NanoActive materials also chemically interact with the odor.

Table 4: Breakthrough Times for SO_2.

Sorbent	Breakthrough time against SO_2 (min) at 25% RH	Improvement over Carbon (URC)
Virgin granular activated carbon	1	-
Carbon (URC)	22	-
NanoActive MgO	38	72%

In Figure 1 below, acetaldehyde adsorption is compared against a NanoActive metal oxide, activated carbon, and sodium bicarbonate. Acetaldehyde is an atmospheric pollutant that at low levels is an irritant of the skin, eyes, mucous membranes, throat and respiratory tract. After just a few minutes of exposure to the chemical, the activated carbon and sodium bicarbonate reached capacity and stopped absorbing the chemical.

Figure 1: NanoActive and Other Chemical Sorbent Technologies vs Acetaldehyde



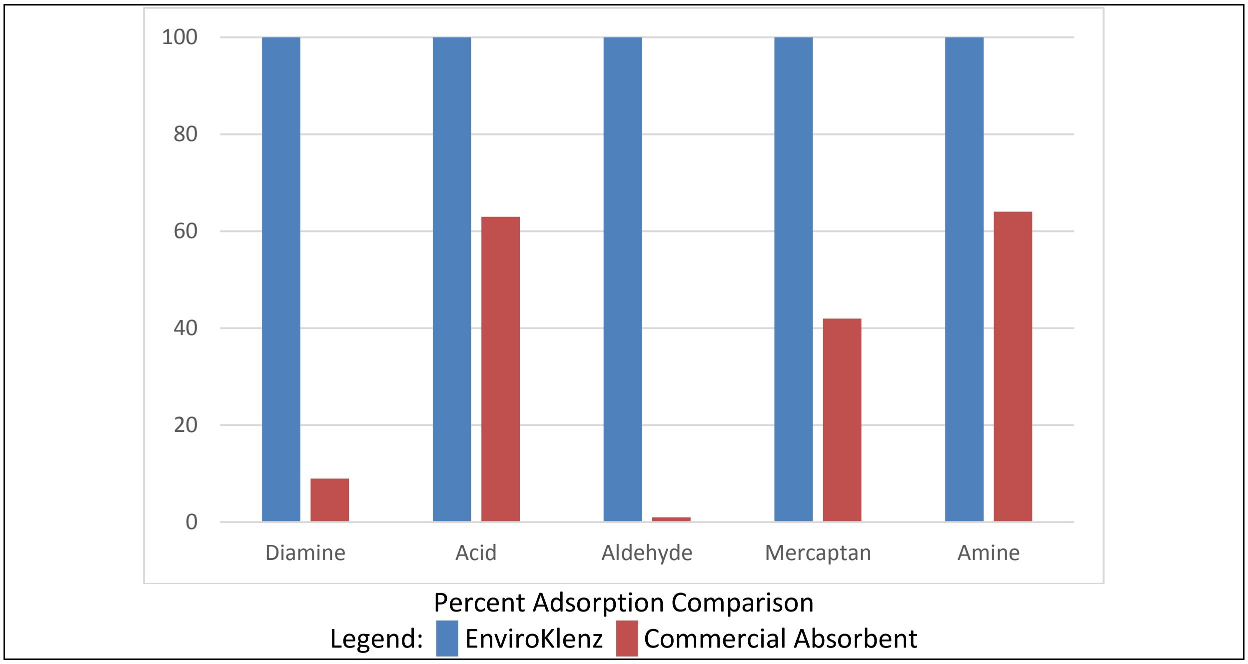
(Percent Absorption vs. Time – 120 minute time period)

<u>Fragrances</u>

Fragrance is a term used to describe a mixture of chemicals often composed of essential oils, chemicals with a strong aroma, and solvents that together produce a “pleasant” scent to the general population. In order to achieve a particular scent, a variety of different ingredients from natural and synthetic sources may be used. Some common chemical classes used include, but are not limited to: esters, terpenes, aromatic organics, amines, alcohols, aldehydes, ketones, and thiols. For individuals with MCS, many chemicals and substances with strong scents are the most common triggers for their symptoms and can include: perfumes, cleaning/disinfecting agents, pesticides, cigarette smoke, and many others.

EnviroKlenz’s broad capabilities and efficacy towards MCS triggers can be demonstrated against commonly encountered chemicals and chemical classes associated with fragrances, indoor air quality issues, and pollutants (Figure 2). For the comparison, EnviroKlenz technology and a commonly used absorbent were challenged against a variety of target chemical compounds that broadly encompass different types of chemical structures and fragrance profiles. The challenge compounds were: cadaverine (a toxic diamine), isovaleric acid (organic fatty acid that can be present in essential oils), acetaldehyde (a common VOC, indoor air contaminant, and component of cigarette smoke), ethyl mercaptan (a powerful sulfur-containing pollutant), and ammonia (a commercial cleaning product and caustic volatile material).

Figure 2: Percent chemical pollutant removed by EnviroKlenz technology



Diamine Challenge: When challenged against cadaverine (a diamine), EnviroKlenz was highly effective in reducing the concentration of this pollutant in the headspace as demonstrated by the greater than 99.9% removed result. The commercial product was not effective against diamine.

Acid Challenge: The isovaleric acid, was easily removed by EnviroKlenz. Greater than 99% of the GC-MS detectable chemical was eliminated from the system. The commercial product showed some success against this compound due to the basic pH of compounds, but it was not as effective EnviroKlenz.

Aldehyde Challenge: When EnviroKlenz was challenged against acetaldehyde, a major toxic component of tobacco smoke and indoor pollutant, it removed greater than 99.9 % of the chemical from the headspace. The commercial product had no effect against acetaldehyde (less than 1%).

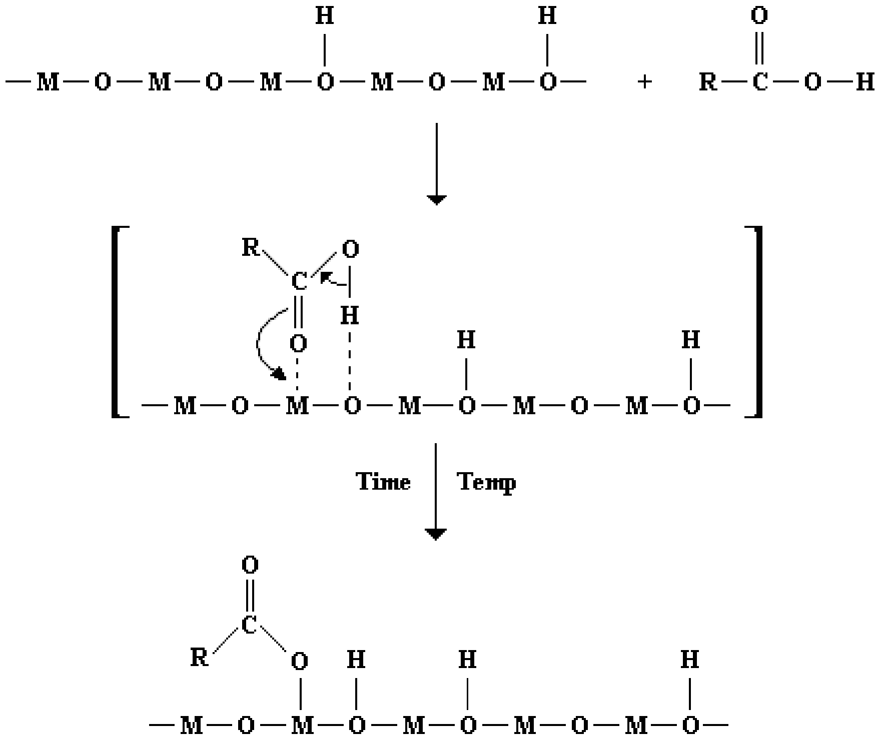
Mercaptan Challenge: Ethyl mercaptan, the sulfur-containing pollutant, was readily neutralized (99.9+%) by EnviroKlenz. EnviroKlenz was over twice as effective as the commercial absorber (43%).

Amine Challenge: Both products had efficacy against ammonia, however the commercial product did not exhibit the broad capabilities against all the other chemical classes like EnviroKlenz.

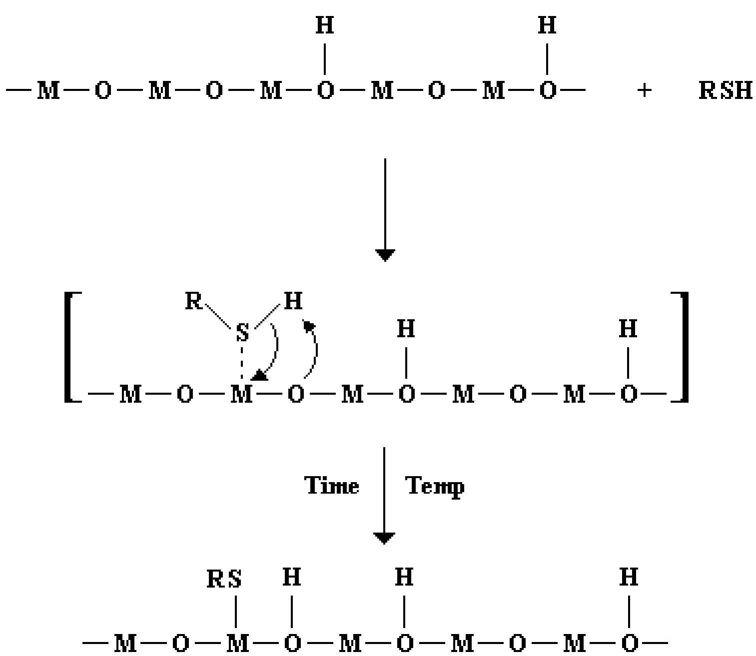
The EnviroKlenz technology utilizes a variety of physical and chemical mechanisms to capture and destroy chemical pollutants. The primary method of capture is physical through the interaction of the high surface area EnviroKlenz metal oxides with the chemical. The EnviroKlenz active components have numerous surface sites to attract and, based on its chemistry, then react with the chemical pollutant. The various mechanisms of reaction are illustrated below, but one key aspect that is common among them is the reaction byproducts are surface bound to the metal oxide surface.

Let's explore some of these mechanisms…

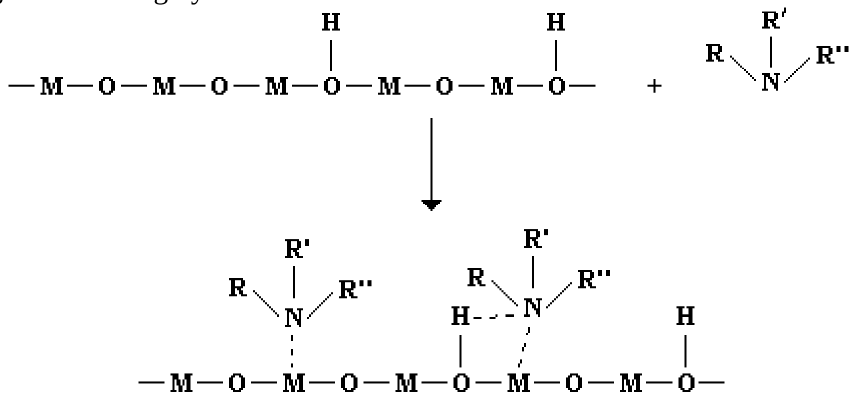
Organic Acids: The metal oxides of EnviroKlenz treat organic acids such as acetic, isovaleric, and propionic acids by acid-base reactions in which the Lewis acid sites of metal ions bind the carboxylate moieties.



Thiols: Sulfhydryl compounds such as methanethiol, ethanethiol, and hydrogen sulfide are neutralized through the attraction of the sulfur atom, a Lewis base, for the Lewis acidic metal ions, together with deprotonation of the sulfhydryl group by oxide anions.



Amines: Nitrogen compound pollutants, including aliphatics such as cadaverine and putrescine as well as heterocycles such as skatole and indole, react with EnviroKlenz by means of the strong attraction between nitrogen and the highly active metal ions of metal oxides.



Ketone/Aldehydes/Alcohols

There are at least 40 carcinogens among the more than 3,800 chemicals in tobacco smoke. The chemicals in tobacco smoke include nicotine, ammonia, hydrogen cyanide, acetaldehyde, methyl chloride and pyridine. Many of these toxins are found in higher concentrations in tobacco smoke than in mainstream smoke (the smoke inhaled by smokers). The U.S. Surgeon General and the National Institute of Occupational Safety and Health have found that simply separating smokers and nonsmokers in the workplace or in public places does not adequately protect nonsmokers from these chemical hazards.

The residual odor left from tobacco smoke is evidence that these toxic compounds still persist even after the "smoke" has dissipated. These toxic chemicals settle on walls, drapes, furniture and floors where they still pose the same toxic health threat days or weeks after they were release. Simply masking these odors offers no health benefits to individuals who are exposed to these compounds regularly.

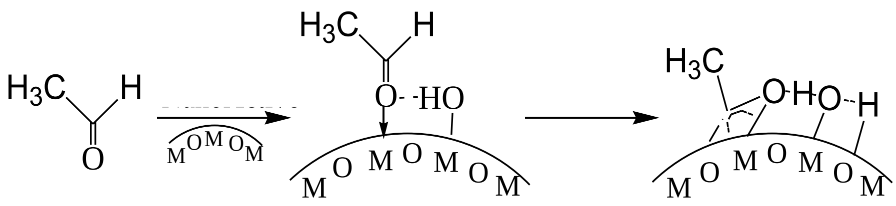
The chemicals listed below are components of tobacco smoke. These chemicals in particular are known to cause serious adverse health conditions for individuals who are exposed to them over a prolonged period of time.

Acetaldehyde	Methyl chloride
Acetone	Nicotine
Ammonia	Nitric oxide
Dimethylamine	Nitrogen dioxide
Hydrogen cyanide	Propionaldehyde
Methylamine	Pyridine

The testing indicated that for all compounds a greater than 90% level of reduction in the original compound after treatment with EnviroKlenz components. Examples of the types of reactions that occur between these toxic compounds and EnviroKlenz materials are listed below:

Acetaldehyde:

Reaction of acetaldehyde with EnviroKlenz sorbents proceeds through the interaction of the carbonyl group with surface metal sites followed by the aldehydic hydrogen dissociation leading to a multilayer dissociative adsorption. Such interaction increases the sorption capacity of EnviroKlenz materials, increasing the life of the sorbent.



Aldehydes & Ketones: Carbonyl compounds such as formaldehyde and acetaldehyde are adsorbed by means of nucleophilic attack of basic metal oxide ions on carbonyl carbon atoms, concomitant with the nucleophilic attack of carbonyl oxygen atoms binding to Lewis acidic metal ions.

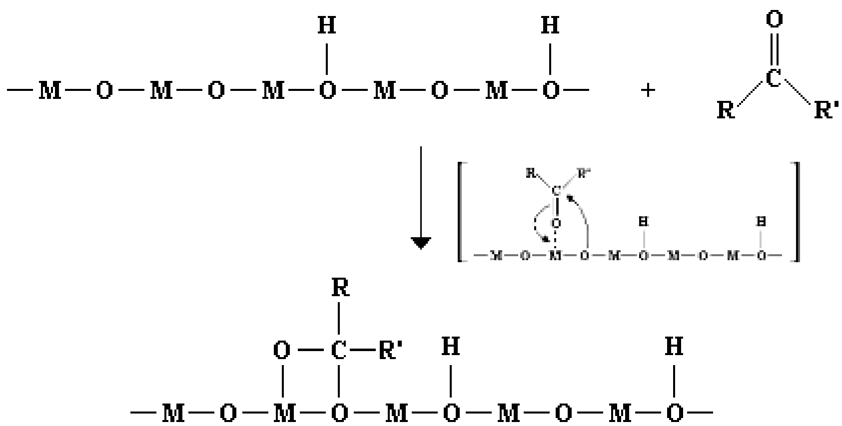
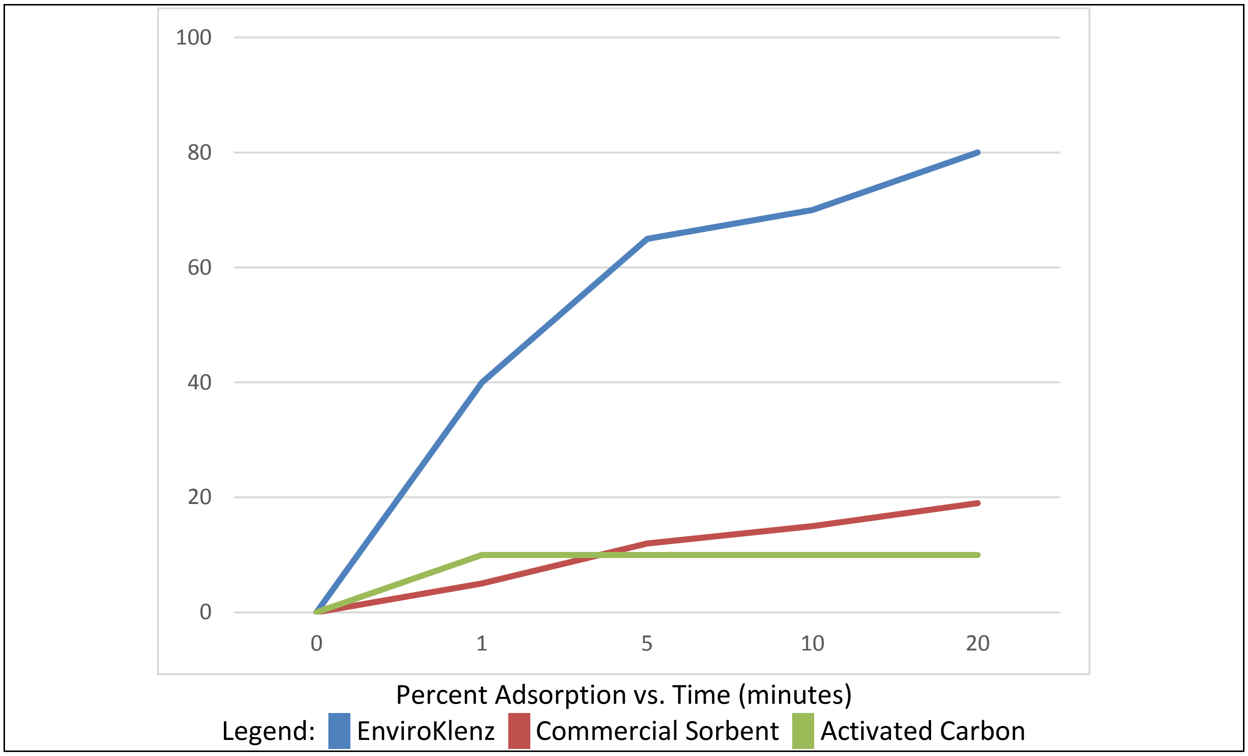


Figure 3 compares the chemical activity of different forms of EnviroKlenz materials towards destructive adsorption of acetaldehyde. When acetaldehyde is adsorbed from an air stream, rapid adsorption takes place with the EnviroKlenz sorbent and nearly none with the commercial material. Note that activated carbon, a commonly used sorbent, is much less effective, while in just a matter of minutes EnviroKlenz adsorbs over 80% of the chemical from the air stream.

Figure 3: Adsorption of Acetaldehyde by EnviroKlenz Materials and a commercial counterpart and activated carbon.



Based on the types of chemical reactions and various efficacy testing done on the formulation, EnviroKlenz is capable of effectively reducing levels of various compounds in this category, including, but not limited to:

Acrolein
Acetic acid
Acrylonitrile
Crotonaldehyde
Carboxylic acids
DDT/ Delirin
Dimethylntrosamine
Ethylamine
Formaldehyde
Furfural
Methyl acrylate
Methylpyrazines
Nonvolatile nitrosamines
N-Nitrosamines
Phenols
Pyrrolidine
Stearic acid
Trimethylamine
Vinyl chloride

Pesticides

Pesticides are used in more than 91% of households in the United States including in the form of disinfectants and animal and insect killers. Indoor contamination with pesticides is quite common. One study suggests that 80 percent of most people's exposure to pesticides occurs indoors and that measurable levels of up to a dozen pesticides have been found in the air inside homes. Reasons for this include contaminated soil or dust that floats in or is tracked in from outside, stored pesticide containers, and household surfaces that collect and then release the pesticides.

Of these pesticides it is estimated that over half used are organophorous compounds. All organophosphates (OP) are derived from one of the phosphorus acids, and as a class are generally the most toxic of all pesticides to vertebrates. Because of the similarity of OP chemical structures to "nerve gases," their modes of action are also similar. Their insecticidal qualities were first observed in Germany during World War II in the study of the extremely toxic OP nerve gases sarin, soman, and tabun. Initially, the discovery was made in search of substitutes for nicotine, which was heavily used as an insecticide but in short supply in Germany.

The organophosphates work by inhibiting certain important enzymes of the nervous system, namely cholinesterase. The enzyme is phosphorylated when it becomes attached to the phosphorous moiety of the insecticide, a binding that is irreversible. This inhibition results in the accumulation of acetylcholine at the neuron/neuron and neuron/muscle (neuromuscular) junctions or synapses, causing rapid twitching of voluntary muscles and finally paralysis.

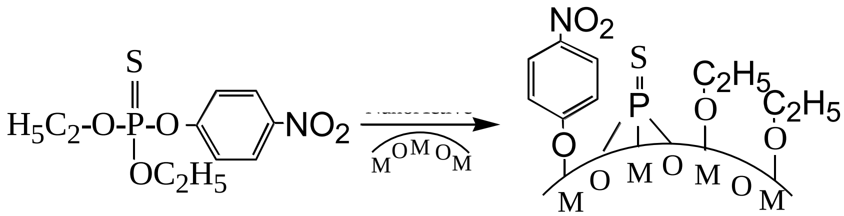
Prolonged exposure to low levels of these pesticides will also cause adverse health impacts for individuals and pets. Children and animals spend a significant portion of time in direct contact with the floor where the highest concentration of pesticides is located within the home. NanoActive sorbents offer the ability to chemically dismantle these toxic compounds and provide a safer indoor environment.

Due to its enhanced chemical reactivity, EnviroKlenz materials have the ability to chemically dismantle a variety of highly toxic compounds. A brief list of common insecticides that have been studied and capable of being neutralized or broken-down due to their chemical composition by EnviroKlenz is as follows:

Acephate
Azinphos-methyl
Bensulide
Cadusafos
Chlorethoxyfos
Chlorpyrifos
Chlorpyrifos methyl
Chlorthiophos
Coumaphos
Dialiflor
Diazinon
Dichlorvos (DDVP)
Dicrotophos
Dimethoate
Dioxathion
Disulfoton
Ethion
Ethoprop
Ethyl parathion
Fenamiphos
Fenitrothion
Fenthion
Fonofos
Isazophos methyl
Isofenphos
Malathion
Methamidophos
Methidathion
Methyl parathion
Mevinphos
Monocrotophos
Naled
Oxydemeton methyl
Parathion
Phorate
Phosalone
Phosmet
Phosphamidon
Phostebupirim
Pirimiphos methyl
Profenofos
Propetamphos
Sulfotepp
Sulprofos
Temephos
Terbufos
Tetrachlorvinphos
Tribufos (DEF)
Trichlorfon

An example of the chemical reactions that occur between EnviroKlenz materials and a typical organophosphate insecticide are outlined below:

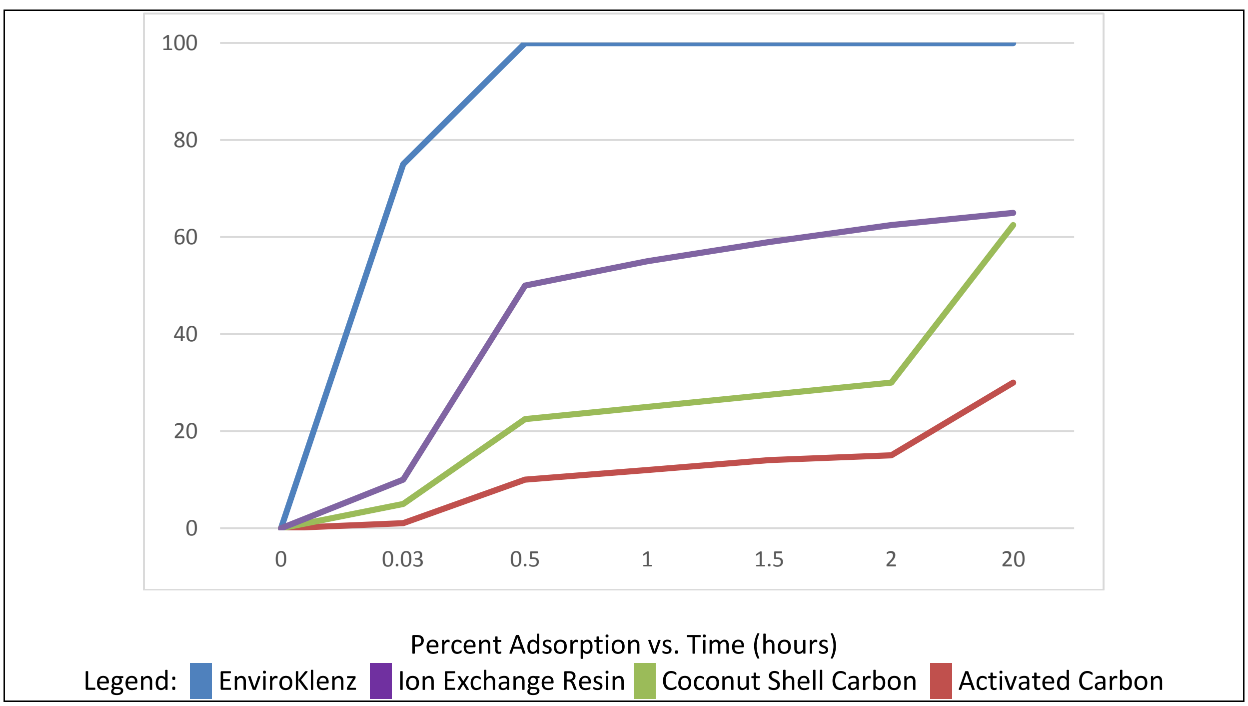
Parathion:



Upon exposure of parathion to the EnviroKlenz material ("MOMOM" metal oxide surface), chemical bonds between the phosphorus and oxygen are broken and the fragments are adsorbed on the surface of the EnviroKlenz product.

Figure 4 presents results of an UV-Vis experiment that demonstrates the superior adsorptive capability of EnviroKlenz materials when compared to a commercial activated carbon, coconut shell carbon, and an ion exchange resin. Note that the EnviroKlenz materials achieved complete adsorption within minutes of exposure to paraoxon (organophosphate) while the carbon and IER samples were significantly less adsorptive and unable to adsorb paraoxon completely even after 20 hours of exposure.

Figure 4: Removal of paraoxon by EnviroKlenz materials, activated carbons, coconut shell carbon, and ion exchange resins.



Volatile Organic Compounds and Other Toxic Volatile Chemicals

Organic chemicals are widely used as ingredients in a variety of household products. Paints, varnishes, and wax all contain organic solvents, as do many cleaning, disinfecting, cosmetic, degreasing, hobby products and all types of fuels. All of these products can release organic compounds during use, and, to some degree, when they are stored.

The EPA's Total Exposure Assessment Methodology (TEAM) studies (Volumes I through IV, completed in 1985) found levels of about a dozen common organic pollutants to be 2 to 5 times higher indoors than outside, regardless of whether the homes were located in rural or highly industrial areas. Additionally, the TEAM studies indicated that while people are using products containing organic chemicals, they can expose themselves and others to very high pollutant levels, and elevated concentrations can persist in the air long after the activity is completed.

Volatile organic chemicals (VOC) encompass a wide range of range of compounds. These chemicals range from slightly hazardous organic solvents up to highly toxic and corrosive acids. They can be found in most industrial and household settings, and can pose a serious hazard for a prolonged period of time in an indoor environment. In addition to organic compounds, there are also a wide range of additional toxic volatile compounds which are commonly found in the home.

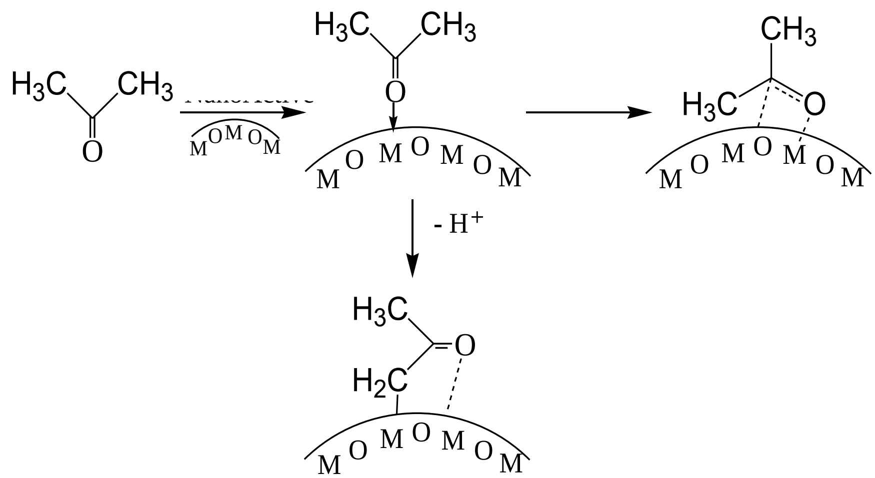
Some common examples of VOCs and other toxic compounds are listed below that studies have shown or their chemistries indicate EnviroKlenz would be effective at reducing or neutralizing:

Acetaldehyde	Nitrous oxide
Acetone	Nitric acid
Ammonia	Nitrobenzene
Ethanolamine	Phenol
Diesel fuel	Phosphoric acid
Formaldehyde	Polyvinyl alcohol
Hydrochloric acid	Sulfuric acid
Hydrofluoric acid	Thiourea
Methanol	Toluene
Methylene chloride	Triethanolamine
Volatile vinyl products	Plasticizers

EnviroKlenz materials are capable of removing and destroying these compounds from a variety of indoor airspaces, processing streams, storage facilities, also anywhere that these harmful compounds are generated. The method or process used in destruction of these compounds differs depending on the compound in question. Due to the inherit stability of low molecular weight hydrocarbons, EnviroKlenz materials will physically absorb these compounds, however will not chemically modify their structure. EnviroKlenz materials will chemically dismantle many VOCs.

Formaldehyde/Acetone:

Reaction of acetone with EnviroKlenz sorbents proceeds through the interaction of the carbonyl group with surface sites that followed by the metal hydrogen dissociation.



Hydrofluoric Acid:

Upon reaction of selected EnviroKlenz materials with any type of acid, the acid is capable of being broken down into safe non-toxic byproducts. As an example sorption/neutralization of hydrofluoric acid is given with the formation of metal fluoride, a benign salt.

$$MO + 2HF \rightarrow MF_2 + H_2O$$

Ammonia:

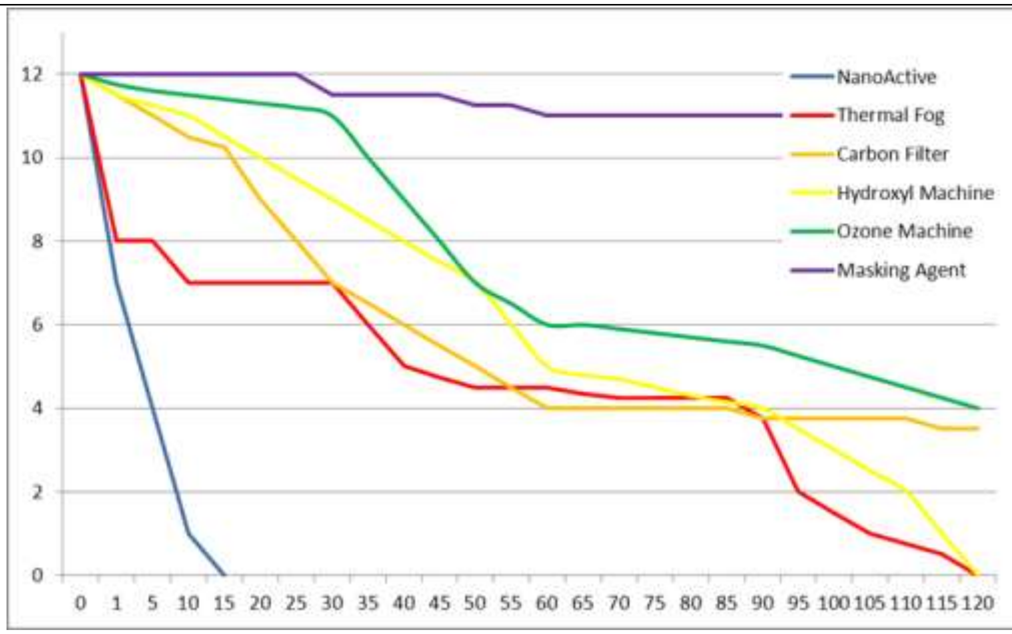
EnviroKlenz materials are also capable of neutralizing basic compounds such as ammonia, which is commonly used in many household-cleaning agents. This occurs through interaction of ammonia with the hydroxyl groups on the surface of sorbent.

Air Unit Comparison

In Figure 5 below, the elimination of hydrogen sulfide was evaluated using some of the most common odor treatment technologies. Hydrogen sulfide occurs naturally in the environment, but is also a result of bacterial breakdown of organic matter, making it common in sewer gas, and has the characteristic foul odor of rotten eggs. Long-term, low-level exposure may result in fatigue, loss of appetite, headaches, irritability, poor memory, and dizziness.

In the experiments, 12 parts per million (ppm) of hydrogen sulfide was released into an environmental chamber and allowed to equilibrate. After a few moments, the various odor treatment devices were turned on remotely and the level of the hydrogen sulfide was monitored with an electronic detector. The NanoActive air cartridge quickly removed and neutralized the gas from the chamber, while the other technologies took two hours or longer for the hydrogen sulfide to be reduced or dissipate.

Figure 5: EnviroKlenz and Other Air Odor Treatment Devices vs Hydrogen Sulfide



(PPM Hydrogen Sulfide vs. Time in minutes)

A key benefit to EnviroKlenz technology over other odor removing devices is that chemicals are not released into the environment. Ozone and hydroxyl machines generate chemical compounds and release them into the air to counteract the pollutants. Chemical treatment methods like fragrances and fogging products typically “work” by masking the odors. EnviroKlenz has the ability to physically and chemically work against the potentially harmful pollutants and chemicals in the environment without releasing chemicals.

Timilon uses a combination of safe and effective proprietary materials that can physically absorb and chemically destroy obnoxious odors from myriad sources. These materials will not re-release trapped odors like carbon does, and will function in a large range of temperature and humidity conditions.

Additional Information

Material Safety

Independent certified laboratories were utilized to conduct evaluations of the products for health and safety risks. The active components that comprise the EnviroKlenz products have been proven safe through oral, pulmonary, ocular, and dermal toxicology testing.

The materials were evaluated for toxicity by the USACHPPM (Unites States Army Center for Health Promotion and Preventive Medicine) Directorate of Toxicology, and MPI Research. The tests followed Environmental Protection Agency protocols and included acute oral toxicity, acute dermal toxicity, skin irritation, skin sensitization, eye irritation, and inhalation. The materials were proven to be safe.

Methods of Testing Notes

1) FT-IR analysis: Fourier Transform Infrared (FTIR) spectrophotometry is used to identify the appropriate functional group for the compound being tested. By monitoring the presence or absence of infrared absorption bands at a particular wavelength or the spectral changes over a period of time, the concentration of the starting compounds, or byproducts of a reaction can be determined. EnviroKlenz materials are typically exposed to a volatile or gaseous agent in a closed system. The concentration is then monitored in the gas phase and the solid is analyzed to determine functional groups and byproducts.

2) GC/MS analysis: Gas chromatography is utilized to extract reaction byproducts and to quantify remaining starting compound from EnviroKlenz Sorbent. EnviroKlenz Sorbent is exposed to the compound. After a predetermined reaction time has passed, the compound is extracted from the sorbent utilizing a suitable solvent and analyzed to quantify remaining starting material and to determine reaction byproducts.

3) UV-Vis analysis: Ultraviolet spectrometry is utilized to monitor the kinetics of reaction between EnviroKlenz Sorbent and a compound. The compound of interest is placed in a solvent, EnviroKlenz Sorbent is added and the disappearance of the compound is monitored over time.

4) Not every chemical listed in this summary report has been evaluated in practical or experimental tests. Some compounds are evaluated based on shared chemistry and functional groups with like compounds.

Supporting Literature

Additional scientific publications outlining the ability of the materials to chemically dismantle compounds:

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5) Khaleel, A.; Kapoor, P.; Klabunde, K.J.; "Nanocrystalline Metal Oxides as New Adsorbents for Air Purification," Nanostructured Materials, 11, 459-468 (1999).

6) Khaleel, A.; Lucas, E.; Pates, S.; Koper, O.; Klabunde, K.J.; "Nanocrystals as Absorbents for Chemical Agents and Air Pollutants," Proc. ERDEC Sci. Conf. Chem. Biol. Def. Res., 323-329 (1999).

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11) Lucas, E.; Decker, S.; Khaleel, A.; Seitz, A.; Fultz, A.; Fultz, S.; Ponce, A.; Li, Wi; Carnes, C.; Klabunde, K.J.; "Nanocrystalline Metal Oxides as Unique Chemical Reagents/Sorbents," Chem. Eur. J., 7, 2505-2510 (2001).

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13) Medine, G.M.; Klabunde, K.J.; Zaikovski, V.; "Unusual Behavior of Nanocrystalline Strontium Oxide Toward Hydrogen Sulfide," J. Nanoparticle Research, 4, 357-366 (2002).

14) Mishakov, I.; Bedilo, A.; Richards, R.; Chesnokov, V.; Volodin, A.; Zaikovskii, V.; Buyanov, R.; Klabunde, K.J.; "Nanocrystalline MgO as a Dehydrohalogenation Catalyst," J. of Catalysis, 206, 40-48 (2002).

15)).Klabunde, K.J.; "Nanometer Sized Metal Oxide Particles for Ambient Temperature Adsorbents of Toxic Chemicals," Mexico Patent 991703, January 8, 2002.

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