Agenda

- **Company Introduction**
- **Importance of Indoor Air Quality**
- **YORK IAQ Solutions**
  - **YORK IAQ Stage 1：Fresh Air;**
  - **YORK IAQ Stage 2：Comfortable Air；**
  - **YORK IAQ Stage 3: Healthy Air；**
    - YORK TiO_2 Product Exhibition

Presentation Agenda For Reference Only

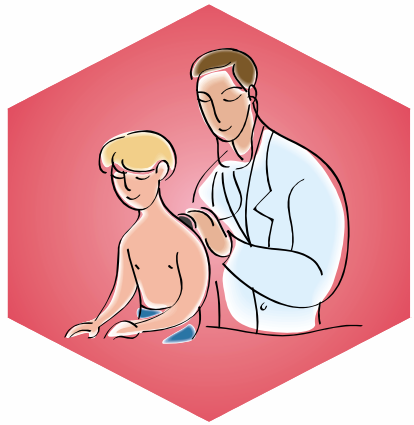
Indoor Air Quality
室内空气质量

What is IAQ – Indoor Air Quality?
The Importance of IAQ -

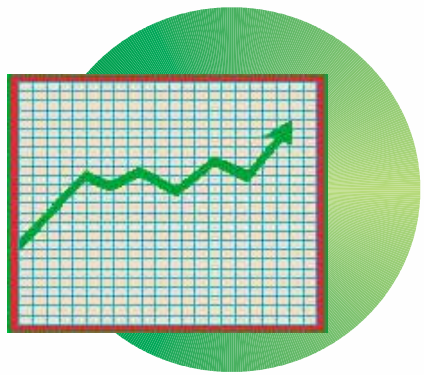
- IAQ parameters cover **indoor temperature, humidity, carbon dioxide level, and air purity etc.** In the past,only the first two were focused
- Today,various factors such as the widely use of central air-conditioning systems, office machines , home appliance and design for energy efficiency have contributed to **accumulation of polluting gas and particles inside a building. The health effect to occupants is known as "Sick Building Syndrome"**
- IAQ draws more concerns to **Environmentalist and brings more attention to general public**

Importance of IAQ

- **90%** of our time is spent at indoor
  - at home, at the office and other indoor environment

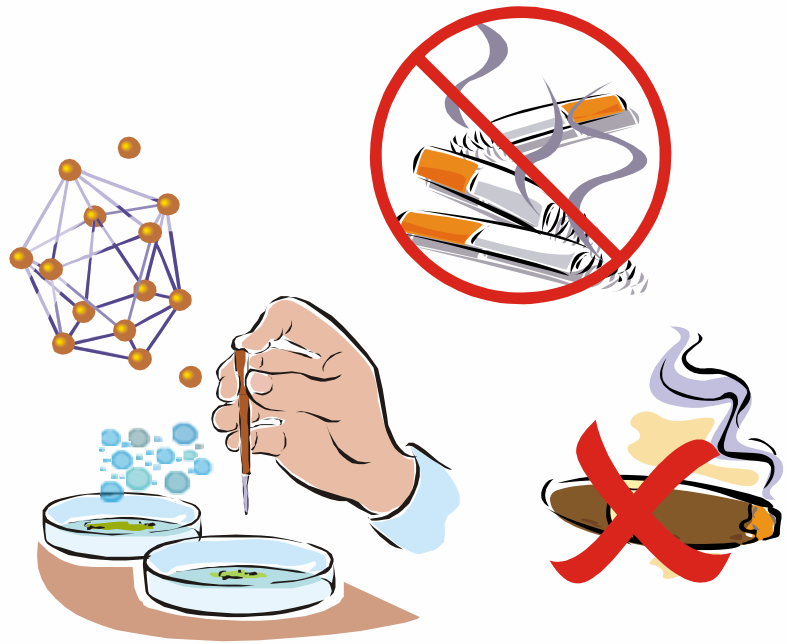


- Improved IAQ leads to **good Health, better Quality of Living** plus **higher Productivity** and **Efficiency**



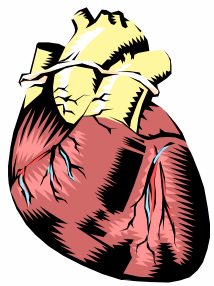
Common Indoor Pollutants

- Chemicals
  - Tobacco Smoke
  - O_3 from Photocopier
  - Emission from Building Materials (Radon & Formaldehyde)
- Particles
  - Dust, Dirt
  - Tobacco Smoke
- Biological Contaminants
  - Bacteria
  - Viruses
  - Fungi (Molds)

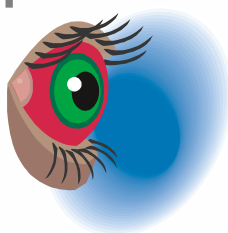


How does Indoor Air Pollution affect our health?

- **The Immediate Effect**
  - Engenders, headaches, reddened eyes, breathing difficulties, painful and itching skin, nausea, and a tendency to become fatigued
  - **Asthma, Allergy-based inflammation of the lungs, eczema and other complaints.**



- **Long Term Effect**
  - Some Health problems may only appear after multiple exposures to polluted indoor air, over a long time, even years. Such problems include respiratory diseases, **heart disease and even cancer.**



*Source: **Straits Times, Singapore** covering the research from the National University of Singapore*

Improve Indoor Air Quality

- Most common approaches to reduce indoor air pollution
  - Source control
    - Eliminate or control the source of pollution
  - Maintain proper Ventilation
    - Dilute and exhaust pollutants
  - Air Cleaning
    - Remove airborne particles, bacteria, germs, virus, VOCs gaseous contaminant, Odor, etc
  - Control indoor temperature and humidity

Typical Technologies to improve Indoor Air Quality

- Filtration
  - Filter air particles, dust mites, etc
  - Filters include Carbon filters and HEPA (high efficiency particulate arresting) filters that apply in Air-conditioner and Air Purifier
  - Filter captures germs and bacteria, *not kill*
  - Exposure to pollutants, germs and bacteria during cleaning and replacement of filter
- Ionization
  - Disperse charged ions into air
  - Ions attach to particles in air giving them negative (or positive) charge
  - *Particles then attach to nearby surfaces* such as floor, wall or furniture
- Ozone Generators
  - When ozone concentration is high enough, gas molecules and certain micro-organisms such as mold and spores are destroyed.
  - It is difficult to remove air contaminants at health level
  - *Excessive Ozone is harmful to health*
- UV light
  - Ultraviolet-C kills germs, microbes and spores by altering their DNA.
  - *Exposure to UV-C is harmful to health*
- Photo-catalytic Oxidation
  - Effective in destroying mold, mildew, bacteria, virus, fungi, and dust mites
  - Decompose VOCs and odor
  - Generate NO secondary pollutants

YORK, your choice for healthy indoors!

YORK IAQ 3 Stages

Stage 1: Fresh Air

Using CO_2 sensor, control the right amount of outdoor air for air freshness and prevent building up of excessive CO_2 and air pollutants inside the space.

Stage 2: Comfortable Air

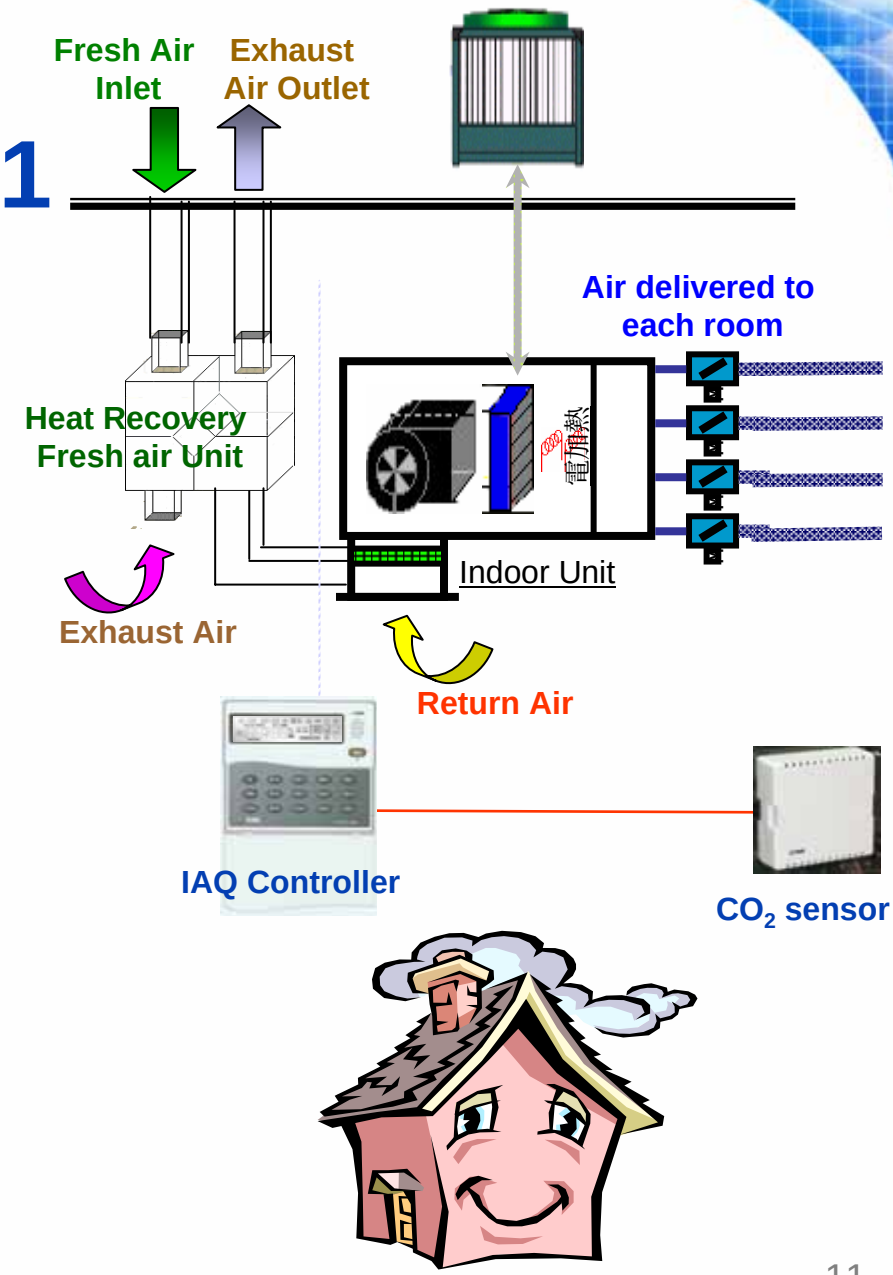
Temperature and humidity are controlled providing human comfort and at the same time suppress the growth of bacteria, mold and other air pathogen

Stage 3: Healthy Air

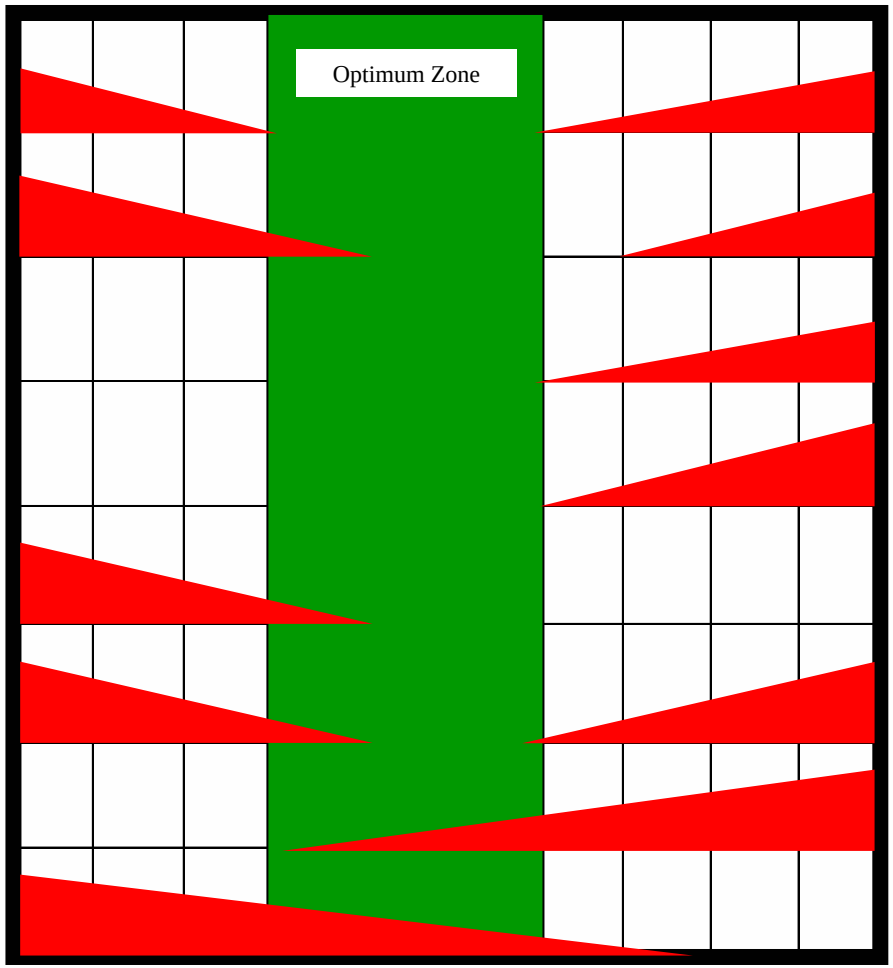
The innovative Nano TiO_2 photocatalytic disinfection system completely removes all air pathogens like bacteria, viruses, and offensive odors, without generation of secondary pollutants, ensuring healthy indoor air

YORK IAQ – Stage 1

- **YORK** Central Residential Air-conditioning System has a **CO_2 sensor** to monitors indoor **CO_2** levels. **York IAQ Controller** delivers the right amount of **Fresh Air** maintaining good **IAQ levels** while minimize energy consumption through the **Heat Recovery Fresh Air Unit- *FRESH AIR***



Impact of Relative Humidity on Air Quality
相对湿度对空气质量的影响



Decrease in bar width indicate decrease in effect.

细菌

病毒

真菌

微生物

呼吸道传染

过敏性鼻炎

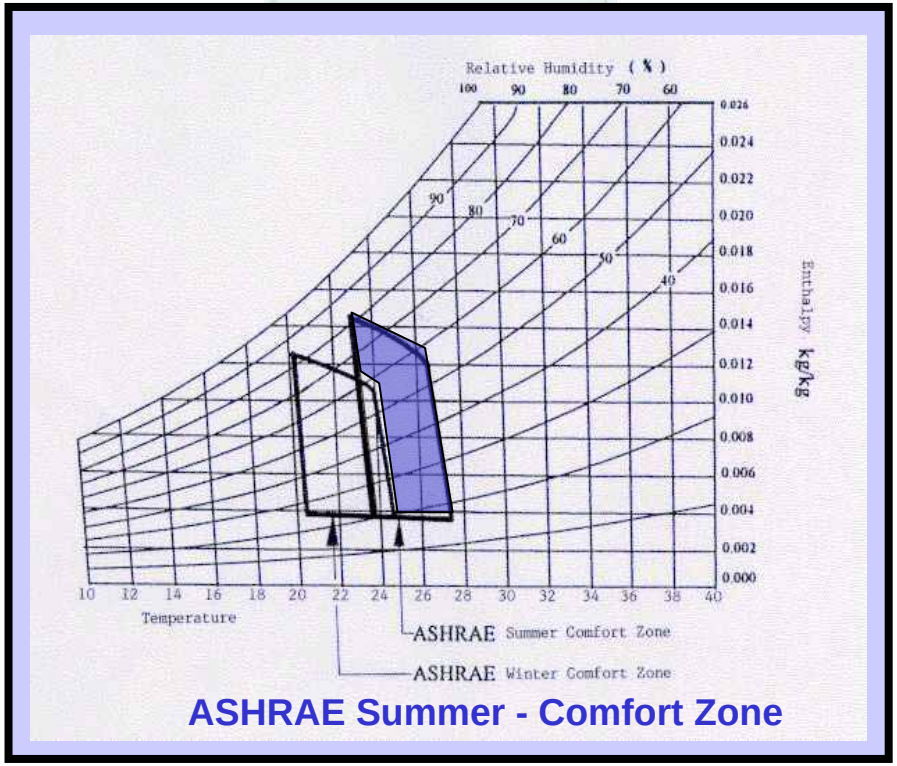
化学交叉感染

产生臭氧

Extract from ASHRAE Handbook 2000

YORK IAQ – Stage 2

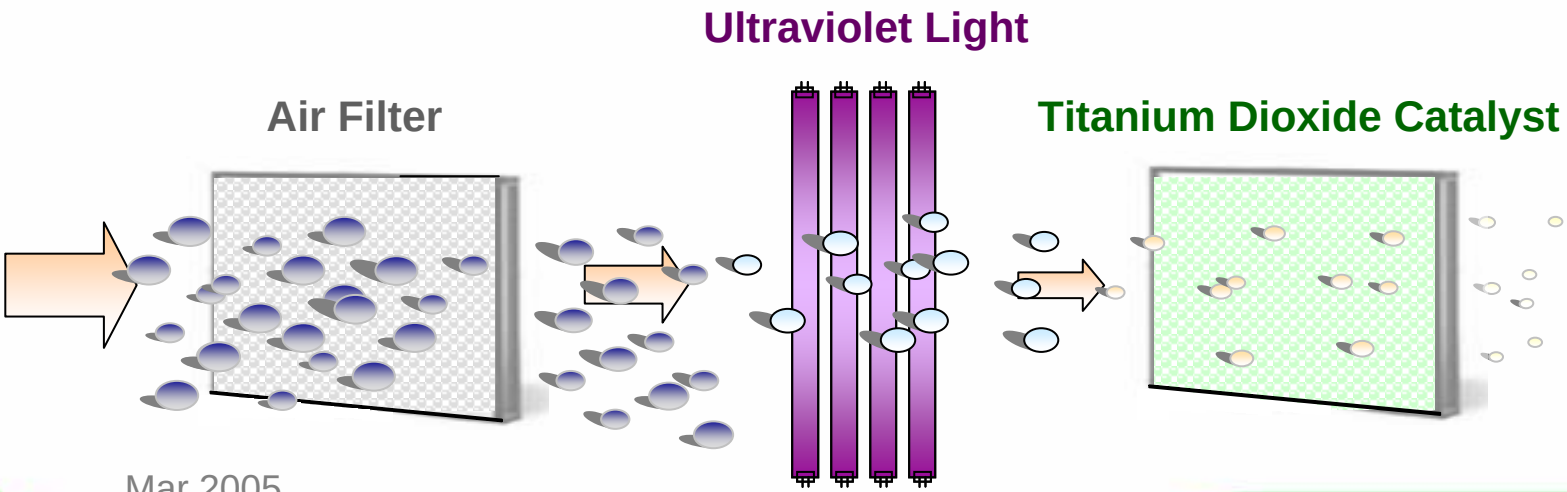
- **YORK IAQ Controller** maintains indoor temperature and humidity at human comfort levels. At right temperature, not only human comfort is achieved, it also suppress the growth of bacteria, mold and other air pollutants - ***COMFORTABLE AIR***



ASHRAE Summer - Comfort Zone

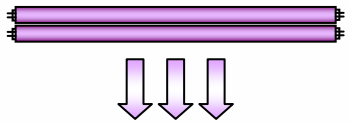
YORK IAQ – Stage 3

- **YORK Nano TiO_2 Indoor Air Disinfection System**
  - **Photocatalytic disinfection technology oxidizes and disintegrates harmful substances in the air, efficiently killing airborne bacteria, viruses and other pathogens, as well as decompose all VOCs. It is environmental friendly and do not generate secondary pollutants – *HEALTH AIR***



YORK IAQ Solutions – "Nano TiO_2"

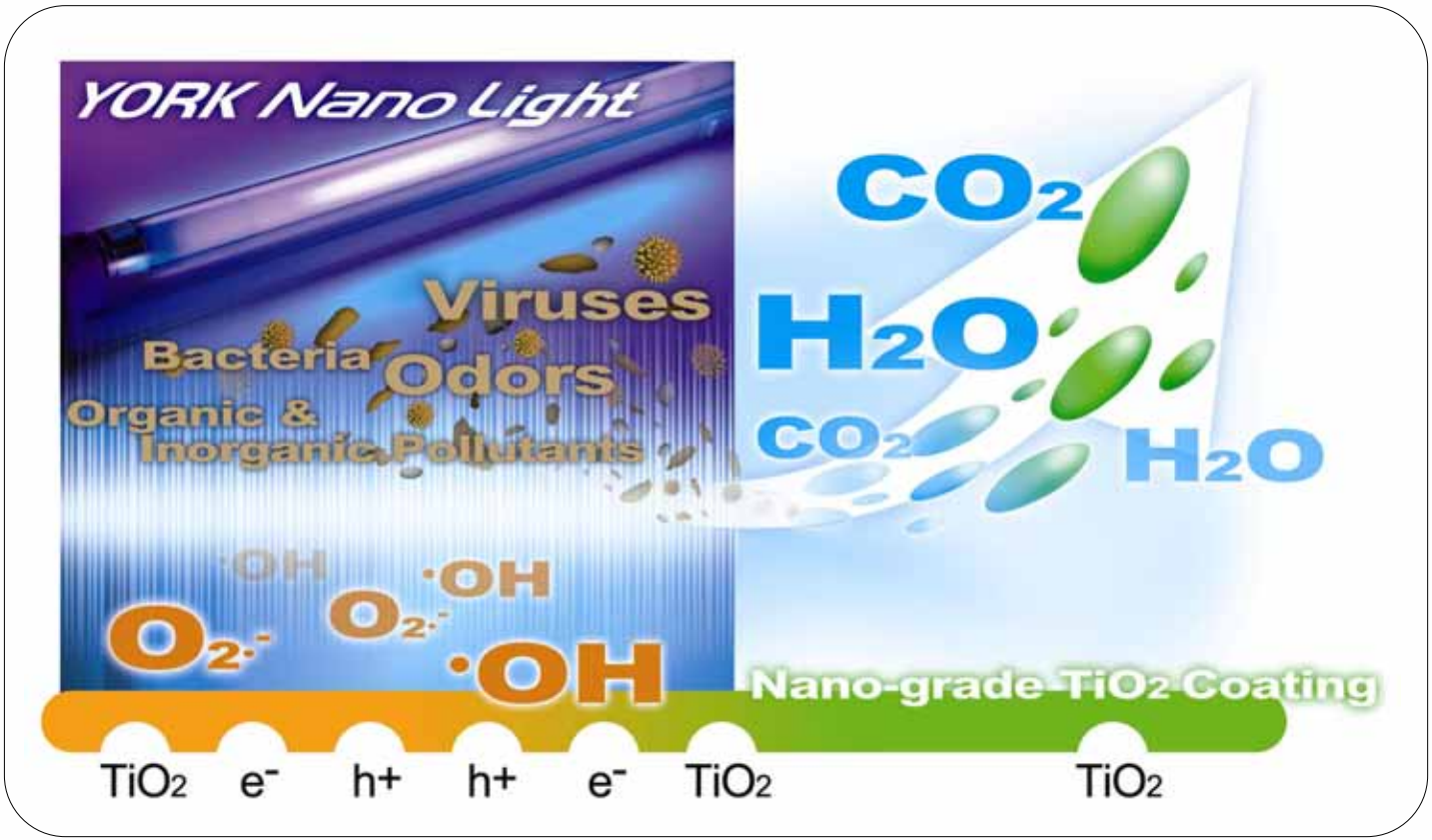
- What is Photocatalytic Oxidation?
  - **Photo - Low Energy Ultraviolet "A" Light**



  - **Catalyst - Nano Grade Titanium Dioxide Film**
  - **Oxidizing Agent - Aggressive & Highly Reactive Hydroxyl Radicals & Super-Oxide Ions**

Continuous repeated process
No TiO_2 is consumed

Decompose just about *all* Organic Pollutants, Bacteria, Virus, Pathogens, Dust Mites ……



The Titanium Dioxide Catalyst Coating

- The TiO_2 catalyst must be evenly applied, with a nano-grade thickness of 1×10^{-9} meters
- TiO_2 will undergo strong photocatalytic oxidation under ultraviolet light only if it is wholly nano-grade
- Patented coating technology guarantees high disinfection efficiency

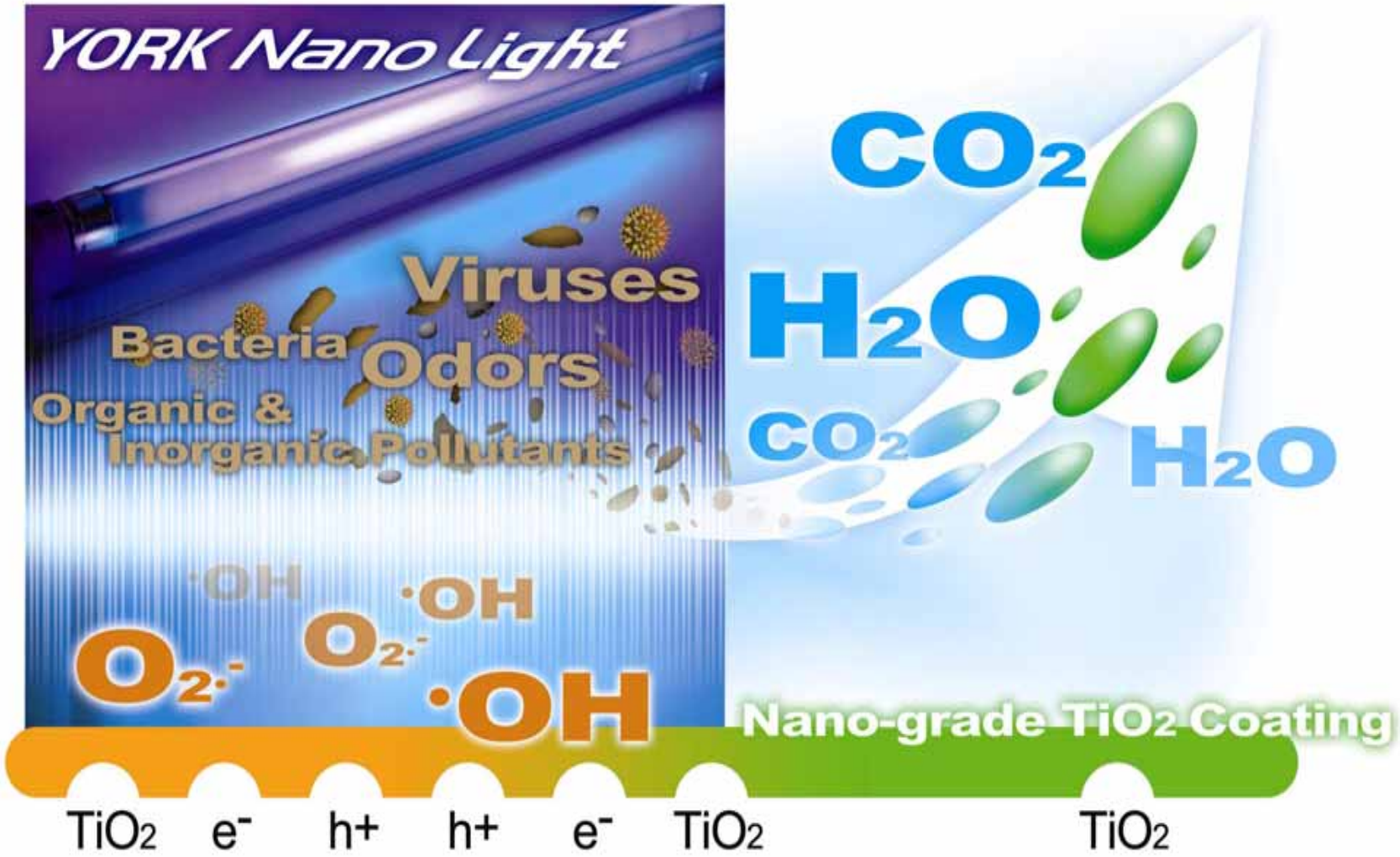
Photocatalytic reaction does not consume any titanium dioxide (TiO_2) catalyst, so there is no need to replace the titanium dioxide coating and therefore assuring extremely long service life

How does YORK Nano TiO_2 Indoor Air Disinfection Technology work?

- The key is the photocatalytic reaction on Titanium Dioxide, TiO_2
  - Ultraviolet light illuminating the surface of the titanium dioxide catalyst generates Hydroxyl Radicals (•OH) and Super-oxide Ions (O2•-). Both have strong oxidation properties
  - The Hydroxyl Radicals (•OH) and Super-oxide Ions (O2•-) can decompose organic pollutants, killing bacteria and viruses and transforming into harmless carbon dioxide (CO2) and water (H2O). The reaction is safe and environmental friendly and no secondary pollutant is created

YORK Nano TiO_2 Air Disinfection System

- Safe and effective, removing virtually all indoor harmful pollutants:
  1. Biological – viruses, bacteria
  2. Organic – Volatile Organic Compounds (VOCs), formaldehyde, benzene, etc…
  3. Non-organic gaseous – NOx, SOx, …
  4. Airborne dust particulates
  5. Smoke and offensive odors
- Tested by Guangzhou Microbiology Research Centre China
  - 95% disinfection efficiency in 6-hour


YORK Nano Light
Viruses
Bacteria
Odors
Organic &
Inorganic Pollutants
CO_2
H_2O
CO_2
H_2O
·OH
O_{2^-}
·OH
O_{2^-}
·OH
Nano-grade TiO_2 Coating
TiO_2 e^- $h+$ $h+$ e^- TiO_2
TiO_2