Decomposing NOx with light

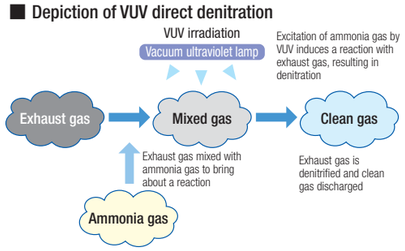
"The world we live in faces a wide variety of problems of global magnitude, from global warming to hunger and water shortages resulting from rapid population growth. Ushio's light solutions are expected to play a role in alleviating one aspect of such problems." So says the development manager of Ushio's NOx* (nitrogen oxide) decomposition technology.

Conducting collaborative research with university laboratories and makers of environmental plants that process waste materials, Ushio succeeded in developing the world's first technology capable of direct denitration of NOx at room temperature without use of a catalyst.

"NOx is a substance emitted in the exhaust of automobiles and ships, diesel engines, fossil-fuel power stations, and waste incineration facilities. It is a pollutant that causes photochemical smog and acid rain. 'Denitrification' is the process of decomposing this harmful pollutant into harmless nitrogen and water vapor. A variety of denitration methods are already in existence, but they all require the use of expensive consumable catalysts or high temperatures in excess of 900 degrees Celsius, making them difficult to introduce in a world that is imposing more stringent controls on emissions. However, Ushio's technology allows a compact device to render NOx harmless at ordinary temperatures without the use of expensive catalysts."

This technology is capable of eliminating SOx* (sulfur oxides) as well as NOx, and thus is attracting a lot of attention as a means of preventing air pollution in a variety of applications.

■ Depiction of VUV direct denitration



Ammonia gas is mixed with exhaust gas and irradiated with VUV, denitrifiying NOx at room temperature.

Protecting the ecosystem with water purification

In addition to technology for treating atmospheric pollutants, Ushio has taken up the challenge of treating water pollution, an issue that adversely affects the ecosystem.

Take, for example, ballast water from ships. When sailing unloaded, freighters and tankers must fill their holds with seawater in order to lower the ship's center of gravity to maintain stability. However, when this water is discharged in preparation for loading the vessel, the organisms it carries are introduced into a different environment, where they can become an invasive species that cause harm to the local ecosystem. This has become a major problem.

"Foreign organisms not only threaten local fishing industries, but present a risk of introducing disease-causing bacteria, such as vibrio cholerae, which can enter the human body and cause illness. The International Maritime Organization (IMO) has made it mandatory for new vessels to be equipped with systems for treating ballast water. In anticipation of this tightening of regulations, Ushio developed an ultraviolet lamp and supporting power supply for use in disinfecting ballast water carried by ships. Disinfection of water by light does not require the use of any chemicals, and thus does not introduce pollutants into the environment."

Ushio's ballast water disinfection solution has already been adopted by a number of shipbuilding companies.

Towards a world without water shortages

With more than 70% of its surface covered in water, the earth is sometimes referred to as the "water planet." However, only a limited amount of this water is suitable for drinking or agricultural purposes, and problems such as population growth and desertification threaten the world with water shortages of ever increasing severity.

* NOx and SOx are atmospheric pollutants that cause photochemical smog and acid rain. Emissions standards have been tightened around the world due to health concerns.

Environment

With air and water pollution increasing, now is the time for us to listen to the earth's cry.

We can stave off environmental pollution using light.

Protecting with Light

VUV light source unit for decomposing NOx/SOx
The world's first method of denitrifying NOx and SOx without using catalysts or high temperatures, VUV direct denitrification technology is making a big impact in the industry.

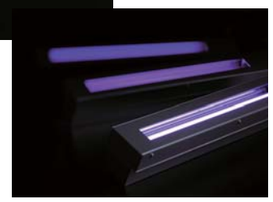
UV sterilizer for water treatment
Providing excellent processing efficiency in a compact package, helps to reduce the cost of water sterilization processing.

"It's said that the English word 'rival' has its roots in the Latin 'rivus,' which means brook or stream. Access to water in streams and rivers has been a source of human conflict since ancient times. While water shortages can sometimes be addressed by desalinization of seawater or transport of fresh water, geographical considerations make these solutions too expensive in some places. Recycling systems that pump used water back underground for reuse are efficient, but can make water unusable if the used water contains harmful substances. However, the water used in recycling systems can be rendered safe by treating it with ultraviolet light, which is capable of killing bacteria and breaking down carcinogens and other harmful substances. With more research, improved filtration systems can be used together with UV treatment for even more effective water purification."

UV water treatment is already used in many countries around the world, and now the method is starting to gain recognition in Japan.

Ushio's vacuum ultraviolet lamp

Excimer lamp



UV-XEFL®

"Domestically, treatment with chlorine is the currently accepted method of disinfecting water. However, the parasite known as Cryptosporidium is resistant to chlorine, and can be more effectively eliminated by treatment with ultraviolet. Ultraviolet has also been recognized as a method of dealing with chlorine-resistant pathogens by Japan's Ministry of Health, Labour and Welfare. Ushio's ultraviolet light helps resolve problems related to water quality in a variety of areas beside drinking water, including the purification of water for use in industries such as the manufacture of semiconductors and chemicals. Water is a precious resource that is vital to all our lives. We would like to achieve a world in which people do not have to fight over water, or worry about the health effects of the water they drink."

While desertification is increasing around the world, flooding and torrential rains also present a challenge to the securing and safety of water resources. In the near future, ultraviolet water treatment technology may help provide a safety net for the protection of water resources.

Reducing CO_2 with vacuum ultraviolet

It is a known fact that a characteristic of VUV (vacuum ultraviolet) is its ability to break down carbon dioxide into its constituent elements. Some dream of taking advantage of this characteristic to break down CO_2, release its oxygen component into the atmosphere and use the carbon that is freed as an energy source. However, coal is nothing more than altered plant matter, transformed over long periods of time from plants that grow by taking up carbon dioxide through photosynthesis. Who can say that this is only a dream?

Besides prevention of pollution and purification of water, issues related to environmental protection abound. We would like to pass on the beauty of nature to future generations, and help build a sustainable society. The environment is a problem that transcends national borders, and Ushio is taking up the challenge with light.

Environment