

Sep 1, 2021

## Panasonic Develops New nanoe™ X Device that Generates the Highest Concentration of OH Radicals in the History of nanoe™ Technology

- Generating 100 times more\*1 OH radicals than the conventional nanoe™\*2 device

**Osaka, Japan** – Panasonic Corporation today announced that through collaboration with Professor Emeritus Yoshio Higashiyama of Yamagata University, it has developed a new nanoe™\*2 X device that generates 100 times more\*1 Hydroxyl (OH) radicals than the conventional nanoe™\*3 device. As a result, the latest nanoe™ X device delivers increased effectiveness in air purification and deodorization in indoor spaces.

Recently, people have become more conscious of the indoor air environment as they cope with lifestyle changes, spending more time indoors, with an increasing number of people refraining from going out and telecommuting.

Since it developed the first nanoe™ device in 2003 designed to improve the air environment, Panasonic has continued to pursue nanoe™ technology over the years. In 2016, the technology evolved into a nanoe™ X device that produces 10 times\*4 more OH radicals than nanoe™. Now, beyond consumer electronics such as air conditioners and air purifiers, the use of nanoe™ and nanoe™ X devices has been expanded to transportation including cars and trains, as well as public spaces such as hospitals and hotels. Through these efforts, Panasonic has been providing clean and comfortable spaces by improving air quality.

While the conventional nanoe™ X device adopts a multi-leader discharge system that achieves a concentrated electric discharge using a 4-needle-shaped counter electrode plate, this newly developed nanoe™ X device has evolved through its round-leader discharge system that discharges electricity in a circular pattern to increase the area for generating OH radicals. This allows the new nanoe™ X device to increase the amount of OH radicals generated to 48 trillion radicals per second, 100-fold\*1 compared to the nanoe™ device, while maintaining the advantages of nanoe's weak acidity and long life properties. This has led to the achievement of the new nanoe™ X device with further improved cleanliness effects as shown below.

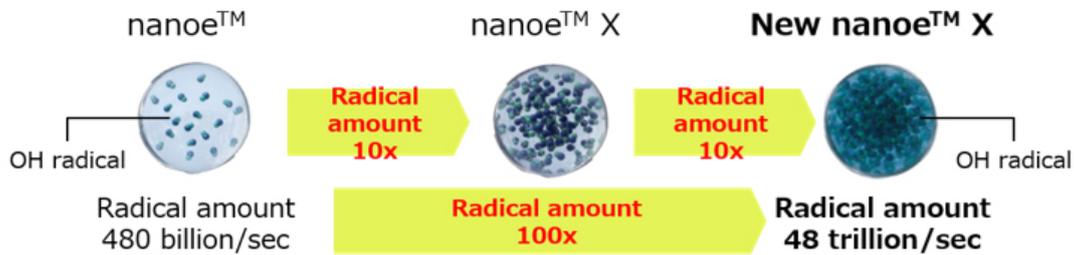
- Time required to inhibit cedar pollen: 1/8 (compared to the conventional nanoe™ X device)
- Time required to deodorize aging odors: 1/8 (compared to the conventional nanoe™ X device)
- Time required to inhibit mold: 1/4 (compared to the nanoe™ device)

Note that these verification tests were carried out in a test chamber and all measured times above differ from those measured in actual use space.

Panasonic will continue to pursue and evolve the potential of its nanoe™ technology and provide clean and comfortable spaces in various facets of our lives and society, including consumer electronics, automotive, and housing-related fields.

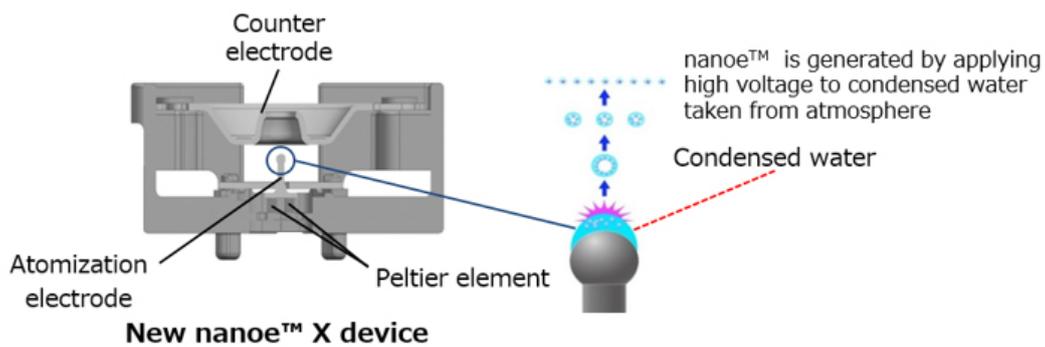
## ■ New nanoe™ X device

The new nanoe™ X device has a 100-fold\*1 increase in the amount of OH radicals generated compared to the nanoe™ device, while maintaining the advantages of nanoe's weak acidity and long life properties. This has further improved nanoe's cleanliness effects.



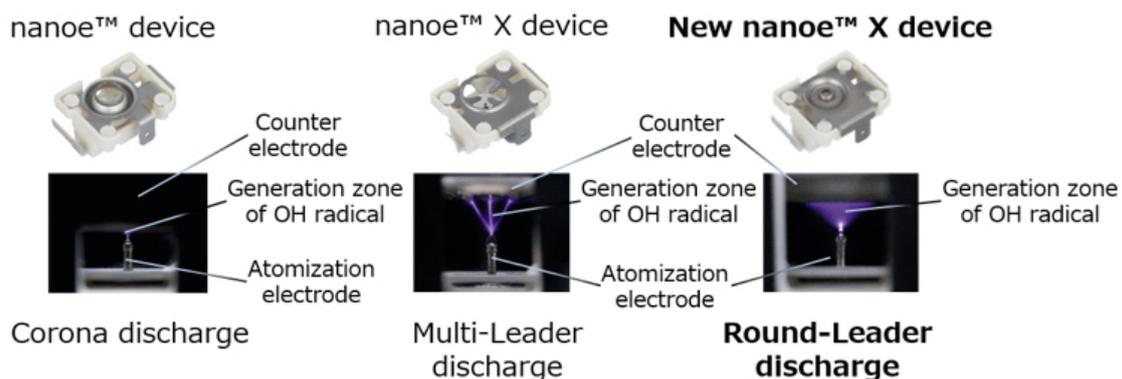
## ■ Principles of nanoe™ generation

nanoe™, which is approximately 5 to 20 nm in size and contains OH radicals, is generated by cooling the atomizing electrode with a peltier element, creating water through the condensation of moisture in the air, and applying a high voltage between the atomizing electrode and the counter electrode plate.



## ■ The round-leader discharge system achieves a 100-fold\*1 increase in the amount of OH radicals generated compared to the nanoe™ device.

While the conventional nanoe™ X device uses a multi-leader discharge system with a 4-needle-shaped counter electrode plate to achieve concentrated electric discharge aimed at the tip of the needles, this new nanoe™ X device adopts a dome-shaped counter electrode plate. The company has developed a new device using a round-leader discharge system that forms countless leader discharge points in a conical shape by shortening the discharge distance. This has expanded the area for generating OH radicals with a high electron density to achieve a 10-fold increase in the amount of OH radicals generated compared to the conventional nanoe™ X device. The development of the new nanoe™ X device has been carried out in collaboration with Professor Emeritus Yoshio Higashiyama of Yamagata University.



## <Career of Professor Higashiyama at Yamagata University>

Yoshio Higashiyama: Professor Emeritus, Yamagata University, National University Corporation

Brief personal record:

Graduated from the Department of Electrical Engineering, Faculty of Engineering, University of Fukui

Received a M.S. degree in Electrical Engineering, Nagoya Institute of Technology

Received a Ph.D. degree in Electrical Engineering, Nagoya University (Doctor of Engineering)

After working as a visiting researcher at Clarkson University (USA) and a visiting researcher at the University of Western Ontario (Canada), he assumed his current position in 1994.

Affiliated academic societies: Institute of Electrical Engineers of Japan, Institute of Electrostatics Japan, Institute of Engineers on Electrical Discharges in Japan, IEEE

### ■ Effects of the new nanoe™ X device

#### ● Time required to inhibit cedar pollen: 1/8 (compared to the conventional nanoe™ X device)

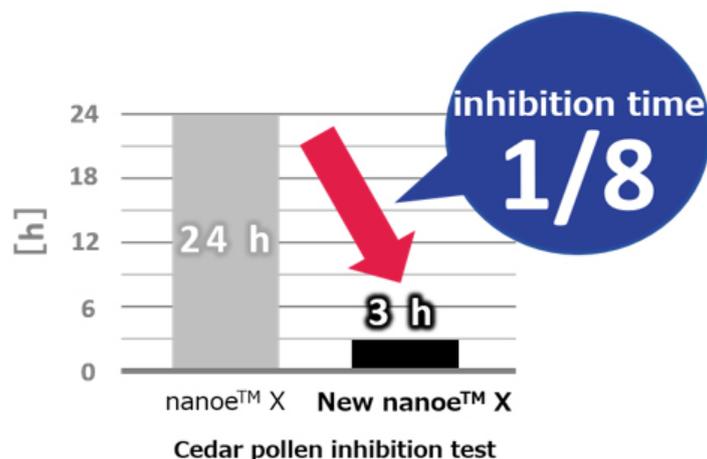
After the most common pollen (cedar) in Japan was set in the center of a 23 m<sup>3</sup> test chamber, an air blower equipped with the new nanoe™ X device was operated for the specified time to check the inhibition of the pollen with the ELISA method.

#### [Overview of the verification]

- Testing organization: Product Analysis Center, Panasonic Corporation
- Verification period: December 2020 to June 2021
- Substances subject to verification: Allergens derived from cedar pollen
- Test method:
  - Test space: 23 m<sup>3</sup> test chamber; Exposure time: 3 hours
  - Analysis method and criteria: Checking the allergen inhibition rate with the ELISA method

#### [Verification results]

It was verified that 99% or more of the cedar pollen was inhibited in three hours.



● Time required to deodorize aging odors: 1/8 (compared to the conventional nanoe™ X device)

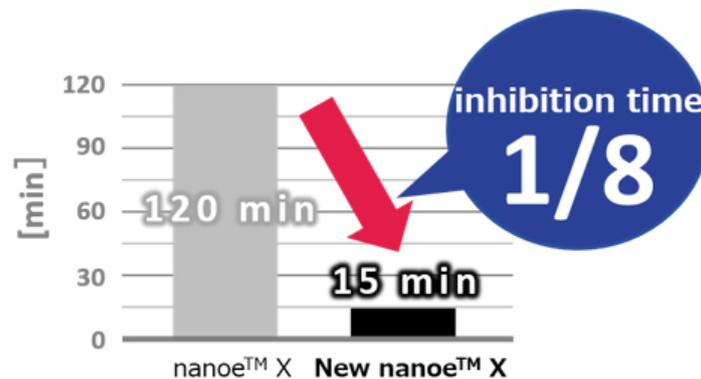
After a cloth to be tested to which body odors (aging odors) had adhered was set in the center of a 23 m<sup>3</sup> test chamber, an air blower equipped with the new nanoe™ X device was operated for the specified time to check the deodorization effect.

[Overview of the verification]

- Testing organization: Product Analysis Center, Panasonic Corporation
- Verification period: April 2021 to May 2021
- Substances subject to verification: Body odors (aging odors)
- Test method:
  - Test space: 23 m<sup>3</sup> test chamber; Exposure time: 15 minutes
  - Analysis method and criteria: Checking the deodorization effect according to the six-grade odor intensity measurement method

[Verification results]

For body odors (aging odors), it was verified that over a period of 15 minutes, the odor intensity was reduced to a level where a different sensation was perceived compared to when such a cloth was left in a natural condition.



Deodorization test (age-related body odors)

● Time required to inhibit mold: 1/4 (compared to the nanoe™ device)

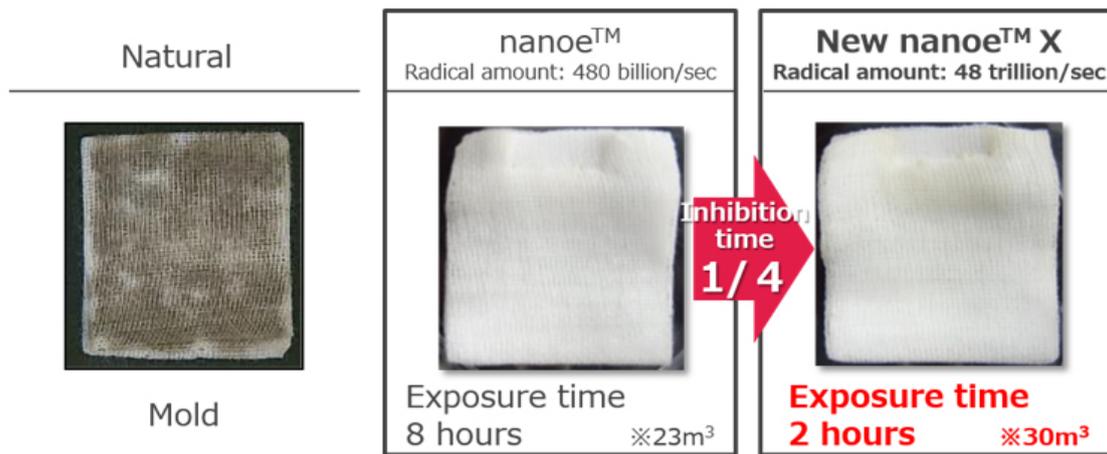
After gauze to be tested to which mold had adhered was set in the center of a 30 m<sup>3</sup> test chamber, an air blower equipped with the new nanoe™ X device was operated for the specified time. Subsequently after retrieving the gauze and leaving it at a temperature of 25°C and a humidity of 90% for mold cultivation, the inhibition of mold growth was confirmed.

[Overview of the verification]

- Testing organization: KAKEN TEST CENTER
- Verification period: June 2021
- Substances subject to verification: Cladosporium / Alternaria
- Test method:
  - Test space: 30 m<sup>3</sup> test chamber; Exposure time: 2 hours
  - Analysis method and criteria: Checking the growth of mold

[Verification results]

It was verified that after the gauze had been exposed to the air blower equipped with the new nanoe™ X device for two hours, the growth of mold (Cladosporium / Alternaria) was inhibited.



※ Results of culturing after placing in a space filled with nanoe™ for a predetermined time

### As a result of confirming the growth of mold

\*1 The new nanoe™ X device generates 48 trillion radicals per second, while the nanoe™ device generates 480 billion radicals per second. (Panasonic data)

\*2 nanoe™, and the nanoe™ mark are trademarks of Panasonic Corporation.

\*3 Nano-sized electrostatic atomized water particles (To generate hydroxyl radicals contained in water, invisible moisture is collected from the air and high voltage is applied)

\*4 The nanoe™ X device generates 4.8 trillion radicals per second, while the nanoe™ device generates 480 billion radicals per second. (Panasonic data)

## Media Contact:

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<https://news.panasonic.com/global/contacts/>

## About Panasonic

Panasonic Corporation is a global leader developing innovative technologies and solutions for wide-ranging applications in the consumer electronics, housing, automotive, and B2B sectors. The company, which celebrated its 100th anniversary in 2018, operates 522 subsidiaries and 69 associated companies worldwide and reported consolidated net sales of 6,698.8 billion yen for the year ended March 31, 2021. Committed to pursuing new value through collaborative innovation, the company uses its technologies to create a better life and a better world for customers. Learn more about Panasonic: <https://www.panasonic.com/global>.

*\*The content in the following news releases is accurate at the time of publication but may be subject to change without notice. Please note therefore that these documents may not always contain the most up-to-date information.*