What is Plasma cluster?

Plasmacluster ions are made from the same type of positive and negative ions that occur in nature

Humans have always been surrounded by naturally occurring positive and negative ions.

Plasmacluster technology generates positive hydrogen ions (H^+) and negative oxygen ions (O_2^-). Simply put, Plasmacluster ions are naturally occurring airborne wat er and oxygen, but in a different form. Let's look at ho w Plasmacluster ions are formed.

https://global.sharp/pci/en/about_pci/

What is Plasma cluster?

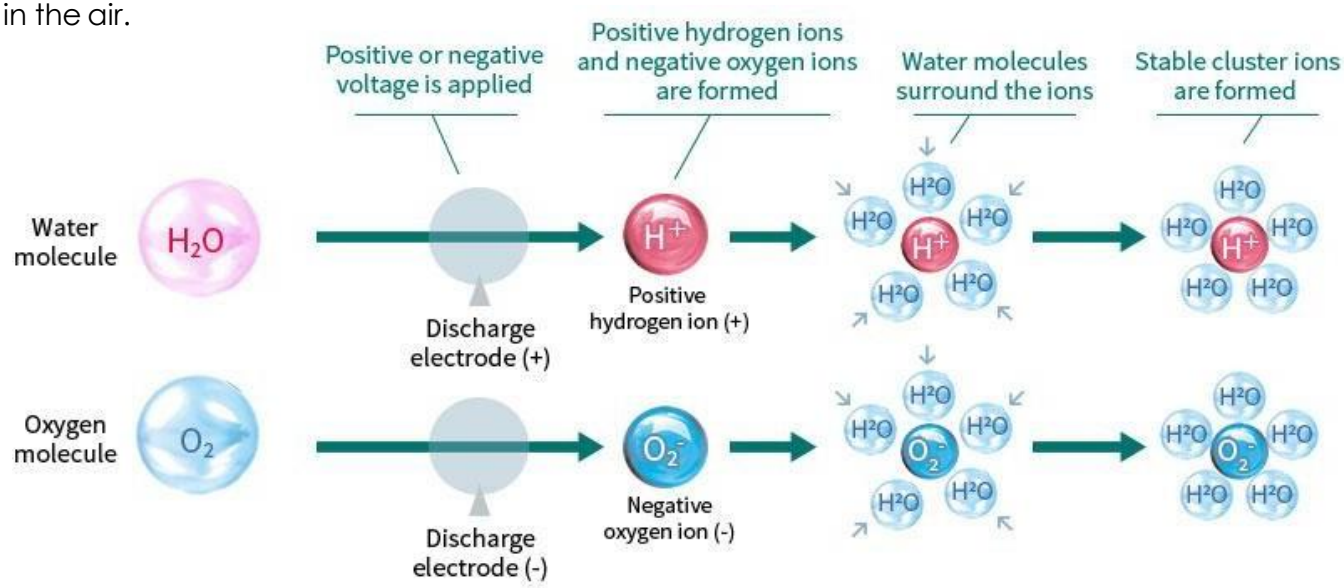
How Plasmacluster Ions Are Generated

① Positive and negative ions are generated through plasma

Ions have positive or negative charges. To ionize the water and oxygen i n the air, Sharp came up with the idea of using plasma discharge to give water a positive charge and oxygen a negative charge.
Through plasma discharge, in which voltage is applied to the discharge el ectrode, positive hydrogen ions (H^+) and negative oxygen ions (O_2^-) are generated from the water and oxygen in the air.

② Ions form clusters for greater

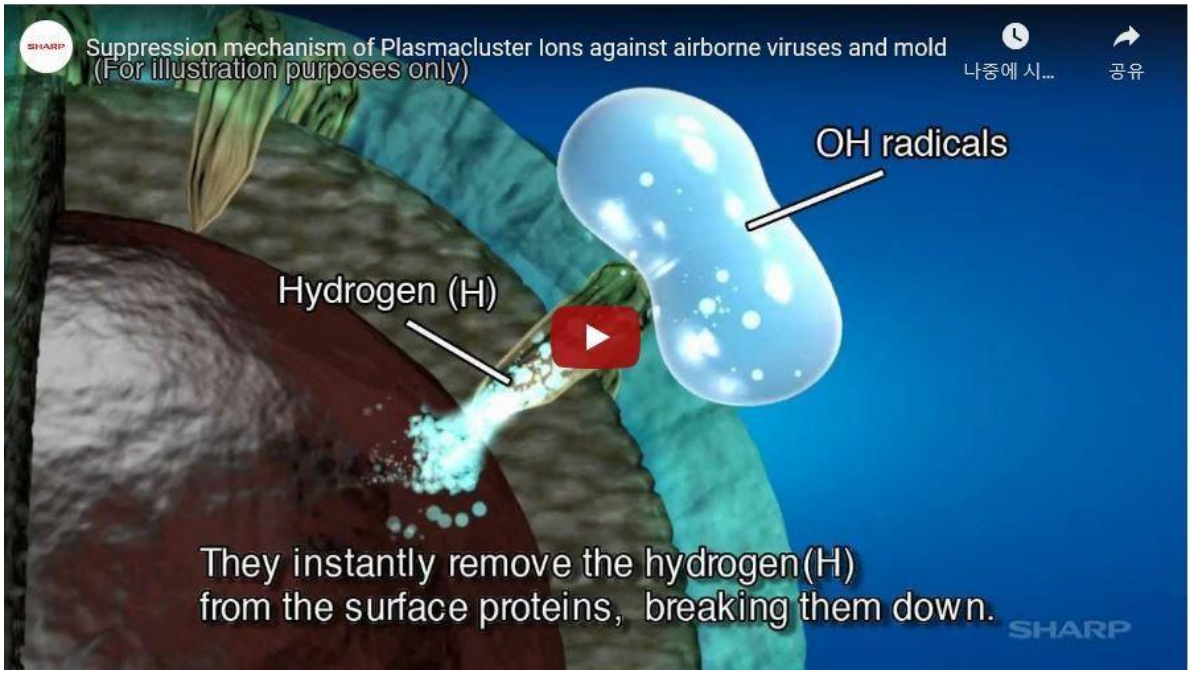
I The positive hydrogen ions (H^+) and negative oxygen i ons (O_2^-) each have an electrical charge. This attracts w ater molecules in the air (H_2O), which surround the ions and form stable cluster ions.



What is Plasma cluster?

Working mechanism of inhibitory effects

The positive (H^+) and negative (O_2^-) ions of the Plasmacluster ions bond on the surface of airborne viruses and other substances and change into OH radicals. With their extremely strong oxidizing power, the OH radicals quickly extract hydrogen (H) from the protein on the surface of viruses and other substances, thus decomposing the protein and suppressing activity. The surface of things like bacteria and allergens consists mainly of protein. Removing the hydrogen atom (H) from this structure inactivates the undesirable substance. Furthermore, the OH radical bonds with the removed hydrogen atom (H) to immediately form water (H_2O), which is returned to the air.



A plasma reactor zaps airborne viruses – and could help slow the spread of infectious diseases

- The Research Brief is a short take about interesting aca demic work.
- **The big idea:** It's the enduring media image of infectio us disease outbreaks, including the current coronavirus outbreak from Wuhan, China: people in public spaces w ith faces half-hidden by surgical masks.
- Filters have long been used to remove particles, includi ng viruses and bacteria, from the air we breathe. Particl e filters are key components of building and aircraft ve ntilation systems. Unfortunately, viruses are much small er than the smallest particles those filters typically capt ure reliably.
- One possibility for curbing the spread of airborne path ogens is a nonthermal plasma reactor. Plasma is the fou rth state of matter, a gas composed of electrically charg ed ions and electrons rather than neutral atoms and m olecules. Nonthermal means the plasma isn't formed at high temperatures. At the University of Michigan, my co lleagues and I developed a nonthermal plasma reactor t hat leaves airborne pathogens unable to infect host org anisms, including people. The plasma oxidizes the virus es, which disables their mechanism for entering cells.
- After testing in the lab and at livestock facilities, we've s hown that the reactor reduces the numbers of infectiou s viruses in an air stream by more than 99%. We're dev eloping the technology for use in animal agriculture, bu t it might also be useful where people are concentrated in enclosed spaces, including commercial aircraft.
- **Why it matters:** Scientists don't know what makes som e viruses and bacteria more resilient in air than others. Tuberculosis and measles have long been known to be highly contagious, while a recent study proved that infl uenza can also remain infectious in air longer than an h our, something that researchers had previously thought unlikely. Enclosed or crowded spaces reduce opportuniti es for virus degradation or dilution in air, increasing the chances that an exposure will lead to infection.
- Infectious diseases that have airborne transmission rout es, including swine flu and avian flu, have affected pork, poultry and egg producers. Porcine Reproductive and R espiratory Syndrome alone has been estimated to cost more than US$600 million annually in the U.S. In 2015, more than 50 million chickens and turkeys were culled t o stop the spread of highly pathogenic avian flu becaus e of its potential to infect humans.

A plasma reactor zaps airborne viruses – and could help slow the spread of infectious diseases

- **What we don't know:** There are several theories of how nonthermal plasmas kill bacteria, but a irborne viruses aren't "alive" like bacteria and therefore can't be "killed" in the same way. Also, r esearchers' understanding of nonthermal plasma sterilization is mostly based on sterilizing contaminated surfaces using minutes-long plasma exposures, much longer than the subsecond exposures studied in our tests and an earlier similar study.

- In our tests, the plasma reduced how many infectious viruses were in the air by more than 99%,but the viruses themselves remained with their DNA largely unchanged. This means that the plasma didn't destroy the virus but rather altered its ability to infect. We're working to understand how this happens, which will help us engineer, or "tune," the reactor.

- **What's next:** My colleagues and I are currently evaluating how ammonia, ever-present around animals as a byproduct of their waste, affects the plasma generated by the reactor.

- We're also considering how to use nonthermal plasma reactors in aircraft. Long-distance flights can transport infected passengers all over the world, as is immediately clear from maps showing confirmed cases of the new coronavirus. Less clear is the risk to fellow passengers. There are ma ny aspects of virus transmission in aircraft cabins, including passenger movement during flights. Cabin air circulation patterns are important in determining how far and where a virus can be tra nsported once shed by an infected passenger.

- Scientists will need to better understand these variables before aircraft makers and operators can use nonthermal plasma reactors to help fight the spread of infectious disease

Cold plasma can kill 99.9% of airborne viruses, study shows by University of Michigan

- Dangerous airborne viruses are rendered harmless on-the-fly when exposed to energetic, charge d fragments of air molecules, University of Michigan researchers have shown.
- They hope to one day harness this capability to replace a century-old device: the surgical mask.
- The U-M engineers have measured the virus-killing speed and effectiveness of nonthermal plas mas—the ionized, or charged, particles that form around electrical discharges such as sparks. A nonthermal plasma reactor was able to inactivate or remove from the airstream 99.9% of a test virus, with the vast majority due to inactivation.
- Achieving these results in a fraction of a second within a stream of air holds promise for many applications where sterile air supplies are needed.
- "The most difficult disease transmission route to guard against is airborne because we have rela tively little to protect us when we breathe," said Herek Clack, U-M research associate professor of civil and environmental engineering.
- To gauge nonthermal plasmas' effectiveness, researchers pumped a model virus—harmless to humans—into flowing air as it entered a reactor. Inside the reactor, borosilicate glass beads are p acked into a cylindrical shape, or bed. The viruses in the air flow through the spaces between th e beads, and that's where they are inactivated.

Cold plasma can kill 99.9% of airborne viruses, study shows by University of Michigan

- "In those void spaces, you're initiating sparks," Clack said. "By passing through the packed bed, pathogens in the air stream are oxidized by unstable atoms called radicals. What's left is a virus that has diminished ability to infect cells."

- The experiment and its results are published in the Journal of Physics D: Applied Physics.

- Notably, during these tests researchers also tracked the amount of viral genome that was prese nt in the air. In this way, Clack and his team were able to determine that more than 99% of the air sterilizing effect was due to inactivating the virus that was present, with the remainder of the effect due to filtering the virus from the air stream.

- "The results tell us that nonthermal plasma treatment is very effective at inactivating airborne vir uses," said Krista Wigginton, assistant professor of civil and environmental engineering. "There a re limited technologies for air disinfection, so this is an important finding."

- This parallel approach—combining filtration and inactivation of airborne pathogens—could provide a more efficient way of providing sterile air than technologies used today, such as filtration and ultraviolet light. Traditional masks operate using only filtration for protection.

- Ultraviolet irradiation can't sterilize as quickly, as throughly or as compactly has nonthermal plasma.

- Clack and his research team have begun testing their reactor on ventilation air streams at a livestock farm near Ann Arbor. Animal agriculture and its vulnerability to contagious livestock diseases such as avian influenza has a demonstrated near-term need for such technologies.

Dirty Banknotes May be Spreading The Coronavirus, WHO Suggests

People have been warned to wash their hands after using banknotes - and if possible to use contactless payments instead

Banknotes may be spreading the new coronavirus so people should try to use contactless payments instead, the World Health Organization has said.
Customers should wash their hands after touching banknotes because infectious Covid-19 may cling to the surface for a number of days, the UN agency said on Monday night.
To prevent the spread of the disease, people should use contactless technology where possible, a spokesperson added. The Bank of England has acknowledged that banknotes "can carry bacteria or viruses" and urged people to wash their hands regularly

https://www.telegraph.co.uk/news/2020/03/02/exclusive-dirty-banknotes-may-spreading-coronavirus-world-health/

WHO Offers Advice About Using Cash as Coronavirus Continues To Spread

The World Health Organization has urged people handling cash to soap up after as the coronavirus continues to s pread to tens of thousands of people across the world, according to a report.

There's a chance that the deadly infection can be transmitted during the transfer of money, the Telegraph reported. "We know that money changes hands frequently and can pick up all sorts of bacteria and viruses and things like th at," a WHO spokesperson told the Telegraph. "We would advise people to wash their hands after handling banknot es, and avoid touching their face."

The international health watchdog added that "when possible it's a good idea to use contactless payments."

https://nypost.com/2020/03/08/who-offers-advice-about-using-cash-as-coronavirus-continues-to-spread/

PLAZMA OIN QUANTITY

- SHARP : 7,000,000~13,000,000/㎤
- **Virus Protector** : Plazma ion cluster over 20,000,000/㎤
  High density ion cluster

When using money sterilizers : bacteria & viruses instantly is destroyed , and It can sterilize banknotes, hands and the surrounding environment.

FUNCTIONS

World First Open-Sterilizer **Different only one Developed**

Sterilization and Removal of Bacterial fine dust upon counting bills... 20 sec. - 98% / 30 sec. - 99.9%

- **Sterilization**
- **Dedusting/Deodorizing/Decontaminating**
- **Quick sterilization using Plasma ion cluster**
- **Sterilization upon counting bills**
  (20 sec - 98% / 30 sec - 99.9% Sterilization)
- **Sterilization harmless to human body**
- **Hand Sterilization**

When counting bills, Plasma ion cluster penetrates between bills and sterilizes bills

Applied HEPA filter to remove fine dust(PM2.5) on bills

Tilted slot, ergonomic design – Easy to insert bills and shoot by camera

High efficiency sterilizing design

PLASMA MONEY STERILIZER operates by auto recognition upon inserting bills

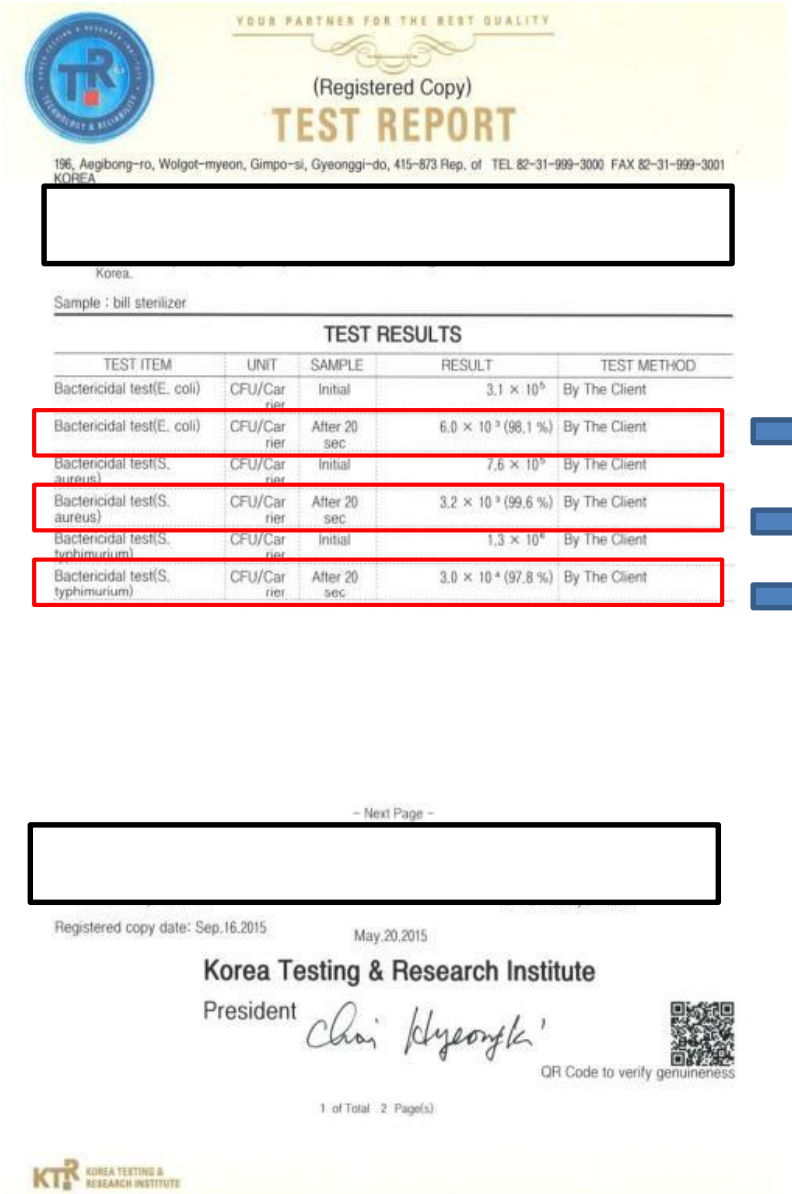
Semi-permanent high efficiency PLASMA MONEY STERILIZER

Built-in communication UTP and POWERline

Automatic sterilization timer setting

Low maintenance cost

TEST REPORT



YOUR PARTNER FOR THE BEST QUALITY

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TEST REPORT

196, Aegibong-ro, Wolgot-myeon, Gimpo-si, Gyeonggi-do, 415-873 Rep. of KOREA TEL 82-31-999-3000 FAX 82-31-999-3001

[redacted]

Korea.

Sample : bill sterilizer

TEST RESULTS

TEST ITEM	UNIT	SAMPLE	RESULT	TEST METHOD
Bactericidal test(E. coli)	CFU/Carrier	Initial	3.1×10^5	By The Client
Bactericidal test(E. coli)	CFU/Carrier	After 20 sec	6.0×10^3 (98.1 %)	By The Client
Bactericidal test(S. aureus)	CFU/Carrier	Initial	7.6×10^5	By The Client
Bactericidal test(S. aureus)	CFU/Carrier	After 20 sec	3.2×10^3 (99.6 %)	By The Client
Bactericidal test(S. typhimurium)	CFU/Carrier	Initial	1.3×10^6	By The Client
Bactericidal test(S. typhimurium)	CFU/Carrier	After 20 sec	3.0×10^4 (97.8 %)	By The Client

- Next Page -

[redacted]

Registered copy date: Sep.16.2015

May.20.2015

Korea Testing & Research Institute

President Choi Hyeongki

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1 of Total 2 Page(s)

KTR KOREA TESTING & RESEARCH INSTITUTE

Bactericidal test(E.coli)	**CFU/Carrier**	**After 20 sec**	**6.0 x 10^3 (98.1%) By The Client**
Bactericidal test(S.sureus)	**CFU/Carrier**	**After 20 sec**	**3.2 x 10^3 (99.6%) By The Client**
Bactericidal test(Styphimurium)	**CFU/Carrier**	**After 20 sec**	**3.0 x 10^4 (97.8%) By The Client**

TEST REPORT (30 SEC)

YOUR PARTNER FOR THE BEST QUALITY

(Registered Copy)

TEST REPORT

196, Aegibong-ro, Wolgot-myeon, Gimpo-si, Gyeonggi-do, 415-873 Rep. of KOREA TEL 82-31-999-3000 FAX 82-31-999-3001

[redacted]

Sample : bill sterilizer

TEST RESULTS

TEST ITEM	UNIT	SAMPLE	RESULT	TEST METHOD
Bactericidal test(E. coli)	CFU/Carrier	Initial	9.2×10^5	By The Client
Bactericidal test(E. coli)	CFU/Carrier	After 30 sec	6.0×10^2 (99.9 %)	By The Client
Bactericidal test(E. coli)	CFU/Carrier	After 1 min	〈20 (more than 99.9 %)	By The Client
Bactericidal test(E. coli)	CFU/Carrier	After 5 min	〈20 (more than 99.9 %)	By The Client
Bactericidal test(S.aureus)	CFU/Carrier	Initial	7.6×10^5	By The Client
Bactericidal test(S.aureus)	CFU/Carrier	After 30 sec	2.4×10^3 (99.7 %)	By The Client
Bactericidal test(S.aureus)	CFU/Carrier	After 1 min	4.0×10^2 (99.9 %)	By The Client
Bactericidal test(S.aureus)	CFU/Carrier	After 5 min	〈20 (more than 99.9 %)	By The Client
Bactericidal test(S. typhimurium)	CFU/Carrier	Initial	1.4×10^6	By The Client
Bactericidal test(S. typhimurium)	CFU/Carrier	After 30 sec	2.0×10^3 (99.9 %)	By The Client
Bactericidal test(S. typhimurium)	CFU/Carrier	After 1 min	6.4×10^2 (99.9 %)	By The Client

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Dec.23.2014

Korea Testing & Research Institute

President Choi Hyeongki

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KTR KOREA TESTING & RESEARCH INSTITUTE

Bactericidal test(E. coli)	CFU/Carrier	After 30 sec	6.0×10^2 (99.9 %)
Bactericidal test(S.aureus)	CFU/Carrier	After 30 sec	2.4×10^3 (99.7 %)
Bactericidal test(S. typhimurium)	CFU/Carrier	After 30 sec	2.0×10^3 (99.9 %)

TEST REPORT ISO (TEST METHOD)

شركة أولاد جاسم الوزان للتجارة العامة ذ.م.م.
JASSIM ALWAZZAN SONS GEN. TRD. CO. w.l.l.
Food Testing Lab مختبر فحص المواد الغذائية

VERIFICATION CERTIFICATE

Certificate No.: AA/QC 115/15
Ref. No.: 180-sultan international co.

Date of certificate : **01 Dec 2015**

Machine name :Money Sterilizer
Model Name :Virus Protector
Manufacture :
Used for : Banknote sterilization

Sterilization / 30 Sec.

Schedule of observations on contaminated notes fed into the note counter/sterilizer:

Test items	Unit	Initial	After 30Sec	Test method
Bacterial test (E.Coli)	Cfu/carrier	~~$6.1x10^5$~~	~~$4.3x10^2$~~	ISO 16654:2001 & Bax
Bacterial test (S.aureus)	Cfu/carrier	~~$5.4x10^6$~~	~~$6.1x10^2$~~	ISO 6888-2:1999
Bacterial test (S.Typhimurium)	Cfu/carrier	~~$3.1x10^5$~~	~~$7.8x10^2$~~	ISO 6579:2002 & Bax

99.99% E.Coli
99.98% Staphylococcus aureus
99.74% Salmonella typhimurium

Reference material used for verification.

sn	Microbial positive control	Code no.	Expiry date
01	E.coli	ATCC 8739	02.2017
02	Pseudomonas aeruginosa	ATCC 9027	02.2017
03	Salmonella typhimurium	ATCC 14028	02.2017

UUT(Unit Under Test) met the claims made by the manufacturer

Comment:
We hereby certify that the instrument listed above ~~UUT met the claims made by the manufacturer~~. Verification has been performed using measurements traceable to national/international references standards via NIST, UKAS, NAMAS or other certificates with some accepted performance adjusted locally to meet THESE SPECIFICATIONS.

PROCEDURE USED: AA/EV.148A **ACTIVE SEP-2005**

Date of certification: - 01 Dec 2015

Approved by:-
Said Azzam
Lab.-Technical Manager
01-12-2015