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# समाचार पत्रों से चयित अंश Newspapers Clippings

A Daily service to keep DRDO Fraternity abreast with DRDO Technologies, Defence Technologies, Defence Policies, International Relations and Science & Technology

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## India test-fires air launched version of BrahMos supersonic cruise missile

*The missile hit a sinking ship with deadly accuracy and the test-firing produced desired results, they said*

New Delhi: In a display of its growing combat prowess, the Indian Air Force on Friday successfully test-fired an air launched version of the BrahMos supersonic cruise missile from a Sukhoi fighter aircraft in the Bay of Bengal, official sources said.

The missile hit a sinking ship with deadly accuracy and the test-firing produced desired results, they said.

The aircraft, belonging to the Thanjavur-based Tigersharks squadron, took off from a frontline airbase in Punjab, and it was refuelled mid-air before the missile was released, they said.

The test firing of the missile came in the midst of India's bitter border stand-off with China in eastern Ladakh.

The missile was fired after the Su-30 MKI aircraft travelled for over three hours covering a "significantly long distance", the officials said.

In May last year, the Indian Air Force for the first time had successfully test fired the aerial version of the BrahMos missile from a Su-30 MKI fighter aircraft.

The BrahMos missile provides the IAF a much desired capability to strike from large stand-off ranges on any target at sea or on land with pinpoint accuracy by day or night and in all weather conditions.

The IAF is also integrating the BrahMos supersonic cruise missile on over 40 Sukhoi fighter jets which is aimed at bolstering overall combat capability of the force.

In the last two months, India has test fired a number of missiles including a new version of the surface-to-surface supersonic cruise missile BrahMos and an anti-radiation missile named Rudram-1.

The Rudram-1 is planned to be inducted into service by 2022.

On October 18, a naval version of the BrahMos supersonic cruise missile was successfully test fired from an indigenously-built stealth destroyer of the Indian Navy in the Arabian sea.

The missile was fired from INS Chennai, a stealth destroyer, and it hit the target with pin-point accuracy after performing "extremely complex" manoeuvres.



A naval version of the BrahMos supersonic cruise missile was successfully test-fired from an indigenously built stealth destroyer of the Indian Navy in the Arabian Sea. | Photo Credit: PTI

BrahMos Aerospace, an India-Russian joint venture, produces the supersonic cruise missile that can be launched from submarines, ships, aircraft, or from land platforms.

India also carried out successful test firing of a laser guided anti-tank guided missile and nuclear capable hypersonic missile 'Shaurya'

The successful test firing of Rudram-1 was seen as a major milestone as it is India's first indigenously developed anti-radiation weapon.

On September 30, India successfully test-fired a new version of the surface-to-surface version of the BrahMos.

The range of the new land attack version of the missile has been extended to 400 km from the original 290 km.

India has already deployed a sizable number of the original BrahMos missiles and other key assets in several strategic locations along the de-facto border with China in Ladakh and Arunachal Pradesh.

<https://www.thehindu.com/news/national/india-test-fires-air-launched-version-of-brahmos-supersonic-cruise-missile/article32986724.ece>



Sat, 31 Oct 2020

## India test-fires air-launched version of BrahMos missile

*The BrahMos missile will provide the Indian Air Force with the capability to strike from large stand-off ranges at any target at sea or land with pinpoint accuracy at any time of the day in all weather conditions*

*By Sangeeta Nair*

The Indian Air Force successfully test-fired an air-launched version of the BrahMos supersonic cruise missile on October 30, 2020.

The BrahMos supersonic cruise missile was test-fired from a Sukhoi fighter aircraft in the Bay of Bengal. The successful test displayed IAF's growing combat prowess.

The missile hit a sinking ship with pin-point accuracy thus, producing the desired results.

### Key Highlights

- The Sukhoi fighter jet belonging to Tigersharks squadron took off from a frontline air base in Punjab. It was refueled mid-air before air launching the missile.
- The missile was fired after the Su-30 MKI aircraft covered a long distance. It had travelled for over three hours before test firing.
- The BrahMos missile will provide the Indian Air Force with the capability to strike from large stand-off ranges at any target at sea or land with pinpoint accuracy at any time of the day in all weather conditions.
- The test-firing of the missile has come in the wake of India's tense border standoff with China along LAC in eastern Ladakh.



## **Significance**

The IAF is integrating the BrahMos supersonic cruise missile on over 40 Sukhoi fighter jets. The move is aimed at bolstering the overall combat capability of the force.

The Indian Air Force had successfully test-fired the air-launched version of the BrahMos missile previously in May 2019. The missile was also fired from a Su-30 MKI fighter aircraft.

## **Other Missile Tests**

- India has test-fired a number of missiles in the last two months including a new version of the surface-to-surface supersonic cruise missile BrahMos and India's first indigenously developed anti-radiation weapon named Rudram-1. The Rudram-1 missile is expected to be inducted into service by 2022.
- The range of the new surface-to-surface BrahMos supersonic cruise missile has been extended to 400 km from the original 290 km.
- The Indian Navy had also successfully test-fired a naval version of the BrahMos supersonic cruise missile from an indigenously-built stealth destroyer of the Indian Navy in the Arabian sea on October 18, 2020. The missile had hit the target with pinpoint accuracy after being fired from a stealth destroyer, INS Chennai.
- India also previously test-fired a laser-guided anti-tank guided missile and nuclear-capable hypersonic missile 'Shaurya'.

## **Background**

The BrahMos supersonic cruise missiles are being produced by BrahMos Aerospace, an India-Russian joint venture. The missiles can be launched from different platforms including land, aircraft and submarines and ships.

India has already inducted a decent number of the original BrahMos missiles and they have been deployed at strategic locations along India's border with China in Ladakh and Arunachal Pradesh.

<https://www.jagranjosh.com/current-affairs/india-testfires-airlaunched-version-of-brahmos-missile-1604129624-1>

# More power to IAF as nuclear-capable BrahMos is successfully test-fired from Sukhoi 30 MKI off Bay of Bengal

*The Indian Air Force (IAF), on Friday, carried out a successful test firing of the DRDO-developed air-launched BrahMos supersonic cruise missile*

## KEY HIGHLIGHTS

- *The aircraft took off from Punjab and the test was conducted off Bay of Bengal*
- *This is also the longest range missile operation for the missile*

New Delhi: The Indian Air Force (IAF), on Friday, carried out a successful test firing of the DRDO-developed air-launched BrahMos supersonic cruise missile from a Sukhoi-30 fighter aircraft to target a ship in the Bay of Bengal. The aircraft had taken off from an airbase in Punjab & reached the Bay of Bengal after mid-air refuelling. This is the second such successful test of the missile, government sources were quoted as saying by news agency ANI.

The development is significant as it is the longest range BrahMos strike that was undertaken by the Sukhoi 30 MKI platform. As reported earlier by Times Now, south India got its first Sukhoi-30 MKI squadron in January this year. "The integration of the air-launched version of the BrahMos missile with the SU-30MKI fighter has been done fully indigenously by BrahMos Aerospace, HAL and the Air Force," Air Chief Marshal RKS Bhadauria had said while inducting the squadron.



File photo, for representational purposes only | Photo Credit: Times Now

## On October 18, the Indian Navy testfired the missile

With a range of 300 km, the air-launched version of BrahMos has the capability to hit targets at sea or land in all weather conditions. On October 18, the supersonic cruise missile was successfully test-fired from Indian Navy's indigenously-built stealth destroyer INS Chennai, hitting a target in the Arabian Sea. "The missile hit the target successfully with pinpoint accuracy," the DRDO had said.

On September 30, a BrahMos missile was tested from the integrated test range at Balasore in Odisha. The test may be viewed on the backdrop of a series of missile tests carried out by India in the recent past. The tests also come at a time when India and China have been locked in a bitter standoff along the Line of Actual Control (LAC) in Eastern Ladakh.

<https://www.timesnownews.com/india/article/more-power-to-iaf-as-nuclear-capable-brahmos-is-successfully-test-fired-from-sukhoi-30-mki-off-bay-of-bengal/675205>

## सुखोई-30 से किया गया ब्रह्मोस मिसाइल का सफल परीक्षण, जहाज को बनाया निशाना

भारतीय वायुसेना ने शुक्रवार को सुखोई-30 लड़ाकू विमान से ब्रह्मोस सुपरसॉनिक क्रूज मिसाइल का सफल परीक्षण किया। समाचार एजेंसी एएनआई के अनुसार सरकारी सूत्रों ने बताया कि यह स्वदेशी मिसाइल डीआरडीओ ने विकसित की है। इस मिसाइल से बंगाल की खाड़ी में एक जहाज को निशाना बनाया गया।

सूत्रों से मिली जानकारी के अनुसार इस परीक्षण के लिए वायुसेना के लड़ाकू विमान सुखोई-30 ने पंजाब में स्थित एक एयरबेस से उड़ान भरी थी और हवा में ही ईंधन भरने के बाद बंगाल की खाड़ी पहुंचा था। उल्लेखनीय है कि यह ब्रह्मोस सुपरसॉनिक क्रूज मिसाइल का इस तरीके का दूसरा सफल परीक्षण है।



ब्रह्मोस मिसाइल (फाइल)-फोटो: Brahmos Aerospace

सूत्रों से मिली जानकारी के अनुसार सुखोई-30 लड़ाकू विमान ने पंजाब के हलवारा एयरबेस से सुबह करीब नौ बजे उड़ान भरी थी। विमान ने हवा में ईंधन भरने के बाद करीब 1.30 बजे इसने जहाज पर निशाना लगाया। सूत्रों ने बताया कि इस दौरान विमान ने 3500 किलोमीटर से ज्यादा का सफर किया।

### सैन्य अभ्यास के तहत नौसेना ने बंगाल की खाड़ी में मिसाइल दागी

उधर, भारतीय नौसेना ने शुक्रवार को बंगाल की खाड़ी में अपने पोत गाइडेड मिसाइल कोरवेट आईएनएस कोरा से एक जहाज-रोधी मिसाइल का सफलतापूर्वक परीक्षण किया। नौसेना ने ऐसा एक अभ्यास के तहत किया जो भारत के आसपास रणनीतिक समुद्री क्षेत्र में उसकी युद्धक तैयारियों को दर्शाता है।

नौसेना ने कहा कि मिसाइल ने अधिकतम सीमा पर स्थित लक्ष्य को बेहद सटीकता से निशाना बनाया। नौसेना ने ट्वीट किया, 'भारतीय नौसेना के गाइडेड मिसाइल कोरवेट आईएनएस कोरा द्वारा दागी गई जहाज-रोधी मिसाइल ने बंगाल की खाड़ी में अधिकतम दूरी पर स्थित लक्ष्य को सटीकता के साथ निशाना बनाया।'

<https://www.amarujala.com/india-news/indian-air-force-carried-out-successful-test-firing-of-brahmos-missile-from-a-sukhoi-30-aircraft>



## ‘Boost to Indian Air Force’: Rudram missile to be inducted by 2022, say top officials

*The missile will help the air force take out enemy air defence systems from large stand-off ranges*  
*By Rahul Singh, Edited by Sparshita Saxena*

India’s first anti-radiation missile ‘Rudram’ will be ready for induction into service by 2022 and will boost the Indian Air Force’s capabilities to knock out enemy radars and surveillance systems, top officials familiar with the developments said on Friday.

The indigenous missile, being developed by the Defence Research and Development Organisation (DRDO) for the IAF, was tested for the first time in the anti-radiation mode from a Sukhoi-30 fighter jet on October 9 against a target on Wheeler Island off the Odisha coast.

“We plan to carry out six to seven more tests before declaring the weapon ready for induction by 2022. The missile’s passive homing head can detect, classify and engage targets over a wide band of frequencies as programmed,” the officials said.

The missile will help the air force take out enemy air defence systems from large stand-off ranges. “With this, the country has established indigenous capability to develop long-range air-launched anti-radiation missiles for neutralising enemy radars, communication sites and other RF emitting targets,” the defence ministry announced on October 9 when the missile’s maiden test was conducted.

While the Rudram is likely to be tested again from a Su-30 jet by the year-end, India is also developing a new air-launched missile capable of knocking out enemy tanks from a stand-off distance of more than 10 kilometres and a crucial test of the weapon will be conducted in two months, as reported by Hindustan Times on October 22.

The indigenous missile - named stand-off anti-tank missile (SANT) -- is expected to be mated to the IAF’s Russian-origin Mi-35 attack helicopters to arm them with the capability to destroy enemy armour from an improved stand-off range. The existing Russian-origin Shturm missile on the Mi-35 can target tanks at a range of 5 kilometres.

The SANT, also being developed by the DRDO, will be launched from a Mi-35 helicopter gunship for the first time in December in what is being seen as a developmental milestone.

The SANT missile was successfully tested from a ground launcher on October 19 off the coast of Odisha - the 13th test-firing of a missile by India in less than two months amid the border stand-off with China and deadlocked talks to reduce tensions along the contested Line of Actual Control (LAC).

The DRDO is also planning to test the ‘Nirbhay’ sub-sonic cruise missile again after a failed test on October 12 when the weapon was tested with an indigenous engine for the first time.

“We are looking at increasing the indigenous content in the missile. Development trials of the missile with the Russian engine were completed last year. A high-powered panel is examining what went wrong with the October 12 launch. We will fix the snag and test the missile again soon,” the officials said.



India successfully testfired ‘Rudram’ Anti-Radiation Missile from a Sukhoi-30 fighter aircraft off east coast on October 9. (ANI)



The key tests recently conducted by India include the supersonic missile-assisted release of torpedo (SMART) to target submarines at long ranges and a new version of the nuclear-capable hypersonic Shaurya missile with a range of 750 kilometres.

India is also developing a new class of ultra-modern weapons that can travel six times faster than the speed of sound (Mach 6) and penetrate any missile defence. In early September, the DRDO carried out a successful flight test of the hypersonic technology demonstrator vehicle (HSTDV) for the first time from a launch facility off the Odisha coast.

Only the United States, Russia and China have developed technologies to field fast-maneuvring hypersonic missiles that fly at lower altitudes and are extremely hard to track and intercept.

India could develop hypersonic cruise missiles powered by air-breathing scramjet engines in about four years.

<https://www.hindustantimes.com/india-news/boost-to-indian-air-force-rudram-missile-to-be-inducted-by-2022-say-top-officials/story-wYBpDlwHjzR8HnYpuOtFBL.html>



Sat, 31 Oct 2020

## भारतीय वायुसेना बनेगी और ताकतवर, 2022 तक रुद्रम मिसाइल भी बेड़े में होगी शामिल

*इस मिसाइल (anti-radiation missile Rudram) के वायुसेना में शामिल होने के साथ दुश्मनों के रडार और सविलांस सिस्टम को ध्वस्त करने की क्षमता और भी ज्यादा घातक हो जाएगी*

नई दिल्ली: देश की पहली एंटी-रेडिएशन मिसाइल रुद्रम (anti-radiation missile Rudram) 2022 तक भारतीय वायुसेना के बेड़े में शामिल की जा सकती है। इस मिसाइल के वायुसेना में शामिल होने के साथ दुश्मनों के रडार और सविलांस सिस्टम को ध्वस्त करने की क्षमता और भी ज्यादा घातक हो जाएगी। हिंदुस्तान टाइम्स पर प्रकाशित एक रिपोर्ट के मुताबिक यह बात अधिकारियों ने बताई है।

### DRDO ने किया तैयार

रुद्रम मिसाइल भारत में ही बनाई गई है। इसे डिफेंस रिसर्च एंड एनालिसिस ऑर्गेनाइजेशन ने भारतीय वायुसेना के लिए तैयार किया है। बीते 9 अक्टूबर को DRDO ने इसका सफल परीक्षण किया था। पिछले कुछ समय से चल रहे कई सैन्य परीक्षणों में यह भी एक अहम परीक्षण है जो वर्तमान भारत-चीन (India-china) सीमा विवाद के लिहाज से देखा जा रहा है। पूरी तरह से स्वदेश में विकसित यह नई पीढ़ी की मिसाइल भारतीय वायुसेना की ताकत कई गुना बढ़ाएगी।

### दुश्मनों की वायु सुरक्षा पर काबू करना उद्देश्य

इस मिसाइल को भारतीय वायुसेना की हवा में वर्चस्व और रणनीतिक क्षमता को बढ़ाने के उद्देश्य से विकसित किया गया है। इसका प्रमुख कार्य दुश्मन की वायु सुरक्षा को काबू (Suppression Of Enemy



एंटी रेडिएशन मिसाइल (Anit Radiation Missile) की तकनीक आधुनिक है जो बहुत कम देशों के पास है. (सांकेतिक तस्वीर)

Air Defenses, SEAD) करना है। यह हवा से जमीन पर मार करने वाली नई पीढ़ी की एंटी रेडिशयन मिसाइल (NGARM) है जिसका काम दुश्मन देश की राडार जैसी मिसाइल की पहचान करने वाली तकनीक को बेकार करते हुए लक्ष्य पर सटीक वार करना है।

इस मिसाइल की रेंज 100 किमी से 150 किमी तक की है। लेकिन यह ऊंचाई के साथ और ज्यादा हो सकती है। इसे 500 मीटर से लेकर 15 किलोमीटर तक की ऊंचाई से लॉन्च किया जा सकता है और 250 किमी दूर तक के लक्ष्यों को भी सटीकता से भेदने में सक्षम है। इस वजह से भारत और चीन के बीच तनाव के बीच यह मिसाइल बहुत ही उपयोगी हो जाती है।

### GPS/NAVIC सैटेलाइट गाइडेंस भी शामिल

इसमें मिलीमीटर वेव सीकर (Seeker) की सुविधा है जो 30 गीगाहर्ट्ज और उससे ऊपर की फ्रीक्वेंसी से ट्रांसमिशन कर सकता है। उड़ान के दौरान दिशाओं की जानकारी के लिए इसमें इनर्शियल नेविगेशन सिस्टम (INS) के साथ ही GPS/NAVIC सैटेलाइट गाइडेंस भी शामिल है। इसका पैसिव होम हेड (PHH) सीकर 100 किलोमीटर दूर तक के रेडियो फ्रीक्वेंसी उत्सर्जन को पकड़ सकता है। जिसमें रेडिएशन उत्सर्जन की पहचान करने वाली मोनोलिथिक माइक्रोवेव इंटीग्रेटेड सर्किट का उपयोग किया गया है।

<https://hindi.news18.com/news/nation/boost-to-indian-air-force-rudram-missile-to-be-inducted-by-2022-say-top-officials-knowat-3317767.html>

## THEWEEK

Sat, 31 Oct 2020

# Why is Indian Navy eyeing lithium-ion batteries for its submarines?

*The Indian Navy has specified a 20-month deadline for the lithium-ion battery project*

The tenders page of any organisation is rarely the place from where you expect breaking news. So it is no surprise that a request for information (RFI) of the Indian Navy issued on October 28 did not make headlines.

But this was no ordinary RFI: The Indian Navy was seeking a system that could potentially revolutionise the performance of its conventional (non-nuclear) submarines. The Indian Navy's RFI document envisages the development of a 'high-capacity' lithium-ion battery system. The Indian Navy wants the system to be capable of being refitted to in-service submarines that use lead-acid batteries.

The Indian Navy has specified a 20-month deadline for the lithium-ion battery project from the date a contract is awarded.

### Why this is a big deal

For over a 100 years, conventional submarines have used lead-acid batteries for underwater propulsion. These ships have diesel engines that are used when the submarine is on the surface of the water. The diesel engines recharge a number of lead-acid batteries on board the ship. A submarine running on batteries is considered very quiet and is often harder to detect than underwater vessels that use nuclear power.



Representational image of a Scorpene class submarine of Indian Navy | Twitter handle of Defence PRO, Visakhapatnam

But the lead-acid batteries typically provide power for short periods (of up to 2 days) and the submarine is required to surface periodically to use air to run its diesel engines. This makes the submarine vulnerable to detection and attack.

From the time of the Second World War, engineers have looked at ways to supplement the submarine's diesel-electric propulsion and reduce its reliance on atmospheric air. Hence, numerous nations have developed forms of 'air-independent propulsion' (AIP) to boost underwater endurance of submarines. Types of air-independent propulsion include technologies such as closed-cycle diesel engines that use liquid oxygen and fuel cells, which would function alongside the diesel engines and batteries.

The DRDO is working to develop a fuel cell system for the Indian Navy that uses phosphoric acid as an electrolyte that reacts with hydrogen (generated from sodium borohydride) and liquid oxygen to generate electricity. The DRDO fuel cell aims to give endurance of up to 14 days to a conventional submarine.

While an AIP system improves a submarine's underwater endurance to 10 days or more, it adds to the complexity of submarine's construction and increases its weight.

### **Advantages of lithium-ion batteries**

Relying on lithium-ion batteries as a replacement for the lead-acid batteries would negate the need for AIP, while improving the underwater endurance of a submarine. Lithium-ion batteries have inherent advantages over lead-acid batteries such as higher power density, lighter weight and lower maintenance costs given absence of need for gas charging or water filling.

US defence website *The Drive* explained the advantages of lithium-ion batteries in an article in 2017. Lithium-ion batteries "keep up their output even when their charge runs low, they are lighter than lead-acid batteries, they can be charged exceptionally fast... and they can store much more energy. Compared to the AIP system they aim to replace, endurance should be similar, while the overall boat's propulsion system design will be less complex and bulky. Not just that, but lithium-ion batteries can provide large output on demand, allowing the boat to dash much faster while dived..." *The Drive* reported.

In short, a submarine with lithium-ion batteries has greater underwater endurance and can run faster than a comparable ship that has lead-acid batteries.

### **Is anyone using lithium-ion batteries on submarines?**

In March this year, Japan commissioned the Ouryu, the world's first submarine that uses lithium-ion batteries in place of lead-acid units. Japan began research into lithium-ion batteries for submarines in 2002. In October, Japan launched the first ship of a class of seven submarines that would use lithium-ion batteries.

In September, South Korean media reported the country plans to induct a submarine equipped with lithium-ion batteries by 2026. The South Korean lithium-ion batteries are touted as being capable of increasing underwater endurance by up to three times compared with ships having lead-acid batteries.

Chinese companies have also been working to develop lithium-ion batteries for submarines, though the extent of Beijing's progress in the field remains unclear.

### **Complicating factors?**

Lithium-ion batteries pose the risk of releasing toxic gases and excessive heat in the event of an explosion, implying a greater risk of damage in the event of a fire. Moreover, cost of lithium-ion batteries remains high: Japan's Ouryu submarine had an acquisition cost of \$608 million, while its predecessor—which was equipped with lead-acid batteries—had a cost of \$488 million, according to *Defense News*.

<https://www.theweek.in/news/india/2020/10/30/why-is-indian-navy-eyeing-lithium-ion-batteries-for-its-submarines.html>

## Indian Army launches indigenous mobile application 'SAI', similar to WhatsApp & Telegram

*In line with PM Modi's 'Aatmanirbhar Bharat Mission', the Indian Army on Thursday launched a secure messaging application platform named it 'SAI'*

*By Gargi Rohatgi*

In line with PM Modi's 'Aatmanirbhar Bharat Mission', the Indian Army on Thursday launched a secured messaging application platform named 'Secure Application for the Internet' (SAI). Speaking further about the details of 'SAI' the Ministry of Defence said that this mobile application for Android will support end-to-end secure voice, text and video calling services. This application is similar to the applications like Telegram and WhatsApp, it added.

Ministry of Defence said, "The model is similar to commercially available messaging applications like WhatsApp, Telegram, SAMVAD and GIMS and utilises end-to-end encryption messaging protocol. SAI scores over on security features with local in-house servers and coding, which can be tweaked as per requirements."



### **Indian Army launches an indigenous messaging application**

According to the statement released by the Ministry of Defence, SAI has been vetted by CERT-in empanelled auditor and Army Cyber Group. It also informed that the process for filing Intellectual Property Rights (IPR) hosting the infrastructure on NIC and working on iOS platform is currently in progress. Ministry of Defence also informed that SAI will be used by pan Army to ensure securing messaging. Upon reviewing the functionalities of the application, Defence Minister Rajnath Singh praised Col Sai Shankar for his skill and ingenuity for developing the application.

### **Aatmanirbhar Bharat Innovation App Challenge**

Prime Minister Narendra Modi on July 4 had launched the 'Aatmanirbhar Bharat App Innovation Challenge' to facilitate the techies and start-up community to create world-class 'Made in India' Apps. Prime Minister had said that there is immense enthusiasm among the tech and start-up community to create world-class 'Made in India' Apps. The challenge ran in two tracks- promotion of existing apps and the development of new apps. The outcome of the challenge was to give better visibility and clarity to existing Indian Apps to achieve their goals and to create tech products to find solutions to tech conundrums.

Bengaluru-based Short-video app Chingari had bagged the social media category award and has now crossed over 10 million downloads. Fitness App StepSetGo, winner in fitness category has crossed 5 million downloads. Micro-site Koo, Zoho, Kutuki, FTC talent amongst others that had



emerged as winners in respective fields are also performing extremely well on the Google Play Store.

<https://www.republicworld.com/technology-news/apps/indian-army-launches-indigenous-mobile-application-sai-similar-to-whatsapp-and-telegram.html>



Fri, 30 Oct 2020

## **Explained: What does Indian Army's latest software Infrastructure Management System do**

*By Vikash Aiyappa*

New Delhi: The Indian Army has introduced a software called the Infrastructure Management System (IMS).

The software was inaugurated by the Chief of Army Staff on the sidelines of the Army Commanders Conference.

Infrastructure development has gained significant importance in many of the Army stations where major works are planned to replace vintage accommodation of pre-independence era. The process is cumbersome and time consuming involving multiple agencies.



Land has also become a very scarce resource since all cantonments and military stations have now come closer to major population centres. Presently all functions towards infrastructure development and management to include ascertaining availability of land, planning and monitoring of works, environment conservation and responsive quartering policies are carried out manually, which is not only time consuming but is also in-efficient.

Realising that automation is the key to empowering all stake holders to transform and become efficient, transparent and enhance accountability, Indian Army has introduced a software named the "Infrastructure Management System (IMS)' software which was inaugurated by the COAS on the sidelines of the Army Commanders Conference.

### **The scope of the software package developed includes the following**

- To automate works initiation, preparation of list and its approval by the MoD.
- To accord administrative approval and monitoring of execution by the CFA.
- To automate availability of CAO pool accommodation, plan vacation, re-allocation and undertake maintenance.
- To automate approval of accommodation allocation/extension for children education ground, special children and Battle/Physical casualty.
- Manage cantonment roads including emergency closure.
- Make land, works and quartering policies available on line.
- Monitor land encroachment, Old Grant Bungalows, VIP references and transfer/exchange of land.

<https://www.oneindia.com/india/explained-what-does-indian-army-s-latest-software-infrastructure-management-system-do-3169783.html>

## **Indian Navy successfully test fires missile as part of military drill in Bay of Bengal**

*The Indian Navy on Friday successfully test fired its anti-ship missile (AshM) in the Bay of Bengal from its Guided Missile Corvette INS Kora and hit the target at max range with precise accuracy*  
*By Niyati Singh*

New Delhi: The Indian Navy on Friday successfully test fired its anti-ship missile (AshM) in the Bay of Bengal from its Guided Missile Corvette INS Kora and hit the target at max range with “precise accuracy”.

“Target ship severely damaged and in flames,” the Navy said in a tweet, adding, “Anti-ship missile fired by Indian Navy’s Guided Missile Corvette INS Kora hits the target at max range with precise accuracy in Bay of Bengal.”

Last week, the Navy had released a video showing the anti-ship missile launched by its Missile Corvette INS Prabal hitting a ship and sinking it with “deadly accuracy”.

The missile was launched as part of a mega drill involving aircraft carrier INS Vikramaditya, aircraft and a number of warships, attack helicopters and other assets of the Navy. “AShM launched by Indian Navy Missile Corvette INS Prabal, homes on with deadly accuracy at max range, sinking target ship,” Spokesperson of the Indian Navy had tweeted alongside videos and pictures from the drill.

In the last few weeks, the Indian Navy has carried out a number of joint maritime exercises.

Last month, the Navy held a three-day drill with Japanese counterpart, and also a two-day exercise with the Australian Navy in the Indian Ocean Region, where the countries participated in drills as such helicopter operations, anti-aircraft exercise and different types of naval activities.

<https://www.hindustantimes.com/india-news/indian-navy-successfully-test-fires-missile-as-part-of-military-drill-in-bay-of-bengal/story-CFNMK20X4wddm31dPUWExH.html>



Anti-ship missile fired by Indian Navy’s Guided Missile Corvette INS Kora hits the target.(Photo: Twitter/@indiannavy)



## चीन को समुद्र से सीधा संदेश, एक हफ्ते में दूसरी बार नौसेना ने किया ऐंटी शिप मिसाइल का सफल परीक्षण

भारतीय सेना ने शुक्रवार को शिप गाइडेड मिसाइल कोरवेट आईएनएस कोरा से एक ऐंटी शिप मिसाइल का सफल परीक्षण किया। इससे पहले नौसेना ने अरब सागर में किसी स्थान पर ऐंटी शिप मिसाइल द्वारा एक डूबते जहाज को सटीक तरीके से नष्ट करने का एक वीडियो जारी किया था।

By Shreyansh Tripathi

कोलकाता: भारतीय नौसेना ने शुक्रवार को बंगाल की खाड़ी में अपने शिप गाइडेड मिसाइल कोरवेट आईएनएस कोरा से एक ऐंटी शिप मिसाइल का सफलतापूर्वक परीक्षण किया। नौसेना ने ऐसा एक अभ्यास के तहत किया जो भारत के आसपास रणनीतिक समुद्री क्षेत्र में उसकी सामरिक तैयारियों को दिखाता है। नौसेना ने कहा कि मिसाइल ने अधिकतम सीमा पर स्थित लक्ष्य को बेहद सटीकता से निशाना बनाया।

नौसेना ने ट्वीट किया, 'भारतीय नौसेना के गाइडेड मिसाइल कोरवेट आईएनएस कोरा द्वारा दागी गई ऐंटी शिप मिसाइल ने बंगाल की खाड़ी में अधिकतम दूरी पर स्थित लक्ष्य को सटीकता के साथ निशाना बनाया।' पिछले सप्ताह, नौसेना ने अरब सागर में किसी स्थान पर ऐंटी शिप मिसाइल द्वारा एक डूबते जहाज को सटीक तरीके से नष्ट करने का एक वीडियो जारी किया था।

### INS प्रबल से दागी गई थी मिसाइल

इस मिसाइल को विमान वाहक पोत आईएनएस विक्रमादित्य और कई युद्धपोतों, लड़ाकू हेलीकॉप्टरों, विमानों और नौसेना के अन्य उपकरणों के साथ किये गए एक व्यापक नौसेना अभ्यास के दौरान 'फ्रंटलाइन कोरवेट आईएनएस प्रबल' से दागा गया था।

### चीन को सख्त संदेश देने की कोशिश

भारतीय नौसेना ने पूर्वी लद्दाख में सीमा गतिरोध को लेकर भारत और चीन के बीच तनाव के मद्देनजर चीन को एक संदेश देने के प्रयास के तहत हिंद महासागर क्षेत्र में अपनी तैनाती में महत्वपूर्ण वृद्धि की है। भारतीय नौसेना ने पिछले कुछ हफ्तों में कई संयुक्त समुद्री अभ्यासों में हिस्सा लिया है, जिसमें 26-28 सितंबर के बीच जापान की नौसेना के साथ तीन दिवसीय अभ्यास शामिल है।

### ऑस्ट्रेलिया की नेवी के साथ भारत ने किया था सैन्य अभ्यास

भारतीय नौसेना ने पिछले महीने ऑस्ट्रेलियाई नौसेना के साथ हिंद महासागर क्षेत्र में दो दिवसीय अभ्यास भी किया था जिसमें कई जटिल नौसेना युद्धाभ्यास, विमान-रोधी अभ्यास और हेलीकॉप्टर संचालन शामिल थे। गत जुलाई में भारतीय नौसेना ने अंडमान-निकोबार द्वीप समूह के तट पर परमाणु



बंगाल की खाड़ी में हुआ सफल परीक्षण



बंगाल की खाड़ी में ऐसा दिखा नजारा

ऊर्जा चालित विमानवाहक पोत यूएसएस निमित्ज के नेतृत्व में अमेरिकी नौसेना वाहक समूह के साथ सैन्य अभ्यास किया था। यूएसएस निमित्ज दुनिया का सबसे बड़ा युद्धपोत है।

<https://navbharattimes.indiatimes.com/state/other-states/kolkata/indian-navy-tested-anti-ship-missile-in-bay-of-bengal/articleshow/78953710.cms>

# The Statesman

Fri, 30 Oct 2020

## OFB awaits field-trials of its ECWCS samples by Army

*The ECWCS will help the soldiers beat the extreme sub-zero temperature in coming months.*

*The government owned Kolkata-based defence manufacturer, the OFB, has completed modifications on the ECWCS samples as suggested by the Army and is now awaiting field trials*

*By Soumyadip Mullick*

Kolkata: With Indian Army jawans expected to remain stationed at high altitudes in Ladakh during winter amidst Indo-China tension, the Ordnance Factory Board (OFB) is still waiting for the army to conduct field trials of its manufactured samples of Extended Cold Weather Clothing System (ECWCS) before procurement.

The ECWCS will help the soldiers beat the extreme sub-zero temperature in coming months. The government owned Kolkata-based defence manufacturer, the OFB, has completed modifications on the ECWCS samples as suggested by the Army and is now awaiting field trials.

An OFB official told The Statesman, “ECC (extreme cold climate) items are used at altitudes ranging from 8000ft-12000 ft with temperature up to minus 20 degree Celsius. The SCME (special clothing & mountaineering equipment) items are meant for high altitudes at and beyond 18000 ft in minus 50 degrees and wind velocity of 40 km per hour.”

“Some ECC & SCME items regularly manufactured and supplied to Army and the Central Armed Police Forces by the Ordnance Factories are ECC coat and trousers, balaclavas, gloves, jacket windcheater, carry packs etc. Some SCME items are imported by the Army but a list of 10 items that were categorised under Atmanirbhar Bharat as import substitute, fall in the range of Ordnance Equipment Factory (OEF) group and ECWCS is one such item” said the official.

However, OFB feels indigenisation is though a prudent policy but will hardly yield benefit unless materialised. “ECWCS samples were developed in 2017 in collaboration with IIT Delhi and submitted to Army for trials along with Indo Tibetan Border Police (ITBP). In December 2018, samples were shown to the Master General of Ordnance (MGO) and permission for trials was sought. MGO directed to submit samples against future Request for Information (RFI). Till date, no RFIs were floated” said Gagan Chaturvedi, deputy DG, OFB communications.

“An RFP for 50000 ECWCS was floated by MGO in June 2020 for past suppliers and user-approved vendors, leaving no options for OFB to participate. We are, however, ready with our samples with modifications suggested by the user (Army) who will carry out field trials. Additionally, samples of OEF items such as boot crampon, rucksack 70 ltr light-weight and sleeping bags are under evaluation “ said the official.

<https://www.thestatesman.com/cities/kolkata/ofb-awaits-field-trials-ecwcs-samples-army-1502932486.html>



## VEM Technologies sets up advanced Seeker facility in Hyderabad

*The company has been working on building Seeker manufacturing capabilities since 2013*

*By Y V Phani Raj*

Hyderabad: Hyderabad-based aerospace and Defence Company VEM Technologies has set up an advanced Seeker manufacturing facility in the city, which is touted as the first such facility in India in the private sector, with indigenous technology.

The new facility set up at Hardware Park in Tukkguda near Srisailem Road with an investment of over Rs 100 crore is spread across 1,25,000 sq ft, with amenities required to carry out the assembly, integration and testing of sub-systems required for radio frequency (RF) and imaging infrared radar (IIR) Seekers under one roof, GP Sarma, senior vice-president, Marketing, VEM Technologies told Telangana Today.



VEM Technologies had been founded by V Venkata Raju, who is also the chairman and managing director of VEM, with an aim to make the company as a systems engineering company offering solutions to the Armed services making the country self-reliant.

The company has been working on building Seeker manufacturing capabilities since 2013.

Seekers help missiles track and strike the targets with accuracy.

Sarma said, “We are looking to cater to domestic needs for RF Seekers. Very few countries in the world have Seeker manufacturing capabilities. Countries such as the US, Russia, France, Israel and India have the capability to make them. There is however a good scope for exporting IIR Seekers.”

VEM’s Advanced Systems Division, which was recently inaugurated by Dr G Satheesh Reddy, Secretary, Department of Defence R&D & Chairman-DRDO, has the capacity to manufacture about 60 RF Seekers per month and about 300 IIR Seekers per month.

“The facility will cater to IIR Seekers for various missile programmes. The company can augment the capacities based on the orders,” Sarma added. The company has received a soft financial assistance from Technology Development Board, Department of Science & Technology, Government of India, to a tune of Rs 25 crore for the ‘Development & Commercialisation of RF Seekers’.

Praveen P A, director, Aerospace & Defence, Government of Telangana said, “Despite Covid, Hyderabad defence and aerospace ecosystem is attracting fresh investments and most players are expanding capacities to meet the opportunities presented by indigenisation goals and Aatma Nirbhar Bharat drive in defence production.”

<https://telanganatoday.com/vem-technologies-sets-up-advanced-seeker-facility-in-hyderabad>



## India acquires 11,000 extreme cold gear sets from US army

By Manu Pubby

### Synopsis

**Sources said that 11,000 sets of extended cold weather clothing system (ECWCS) arrived late last month after India made an urgent request for assistance under a bilateral pact. These sets have come from the stockholdings of the US Army and have been dispatched to forward areas where troops are braving the cold.**

New Delhi: India activated a key foundational pact with the US last month to acquire urgently needed high-altitude systems for soldiers deployed to forward areas along the Line of Actual Control in Ladakh who are likely to stay on through the winter as tensions with China continue.

Sources said that 11,000 sets of extended cold weather clothing system (ECWCS) arrived late last month after India made an urgent request for assistance under a bilateral pact. These sets have come from the stockholdings of the US Army and have been dispatched to forward areas where troops are braving the cold.

This is perhaps the first time the Logistics Exchange Memorandum of Agreement (Lemoa), signed in 2016 after years of discussion, has been used in an operational context. The pact gives the two nations access to each other's military and civil facilities for repairs, supplies and refuelling and has earlier been used during wargames and occasional refuelling of ships and aircraft.

Sources said that so urgent was the need that the US was requested to provide all possible stocks that could be spared. India has over 50,000 additional troops deployed in Ladakh to counter the massive PLA build up since early May.

ECWCS are vital to keep soldiers alive at extreme altitude and temperatures which could touch -40 degrees Celsius in winter. So vital was the need that a small number of the ECWCS systems that arrived included ones issued to US soldiers in the past.

Having exhausted reserves, India has been hard pressed to find clothing and habitat systems for thousands of soldiers inducted at the heights. All Indian missions abroad have been tasked with a specific list of equipment that is required by the Army, which include boots, tents, sleeping bags, suits and socks. However, it has not been easy to find sources of supply that can quickly deliver products. Also, such large quantities of high altitude survival gear are not readily available in the patterns and colours suited for military use.

<https://economictimes.indiatimes.com/news/defence/india-acquires-11000-extreme-cold-gear-sets-from-us-army/articleshow/78922920.cms>



## Quad set to kick off Malabar drills in Bay of Bengal, China to keep watch

*The opening phase of the multi-nation naval drills will be staged off Visakhapatnam from November 3 to 6*

*By Rahul Singh*

New Delhi: The navies of India, United States, Japan and Australia are set to kick off the first phase of the Malabar exercise in the Bay of Bengal next week, officials familiar with the development said on Friday, announcing the line-up of major warships and aircraft that will take part in the drills that are expected to be closely tracked by China.

The opening phase of the multi-nation naval drills will be staged off Visakhapatnam from November 3 to 6. The drills come at a time of increased Chinese belligerence in the Indo-Pacific region and the border row with India in the Ladakh theatre.

“Phase-1 of MALABAR 20 will witness participation of Indian Navy units with USN Ship USS John S McCain (a guided-missile destroyer), RAN Ship HMAS Ballarat (long range frigate) with integral MH-60 helicopter, and JMSDF Ship JS Onami (destroyer) with an integral SH-60 helicopter,” said an official.



Seen here are USS John McCain and Australian Navy's HMASBallarat. (Photo@USPacificFleet)

Indian and US aircraft carriers will not feature in the first phase and are likely to be deployed in the second phase of the exercise in the Arabian Sea in mid-November.

Led by Rear Admiral Sanjay Vatsayan, Flag Officer Commanding, Eastern Fleet, the Indian participation in the first phase of the drills will include destroyer INS Ranvijay, frigate INS Shivalik, off-shore patrol vessel INS Sukanya, fleet support ship INS Shakti and submarine INS Sindhuraj, official quoted above said.

“In addition, advanced jet trainer Hawk, long-range maritime patrol aircraft P-8I, Dornier maritime patrol aircraft, and helicopters will also be participating in the exercise,” the official added.

China has been wary of the Quadrilateral security dialogue, or Quad, that was revived in late 2017 by India, the US, Australia and Japan, and these suspicions have increased since the four countries upgraded the forum to the ministerial level last year.

The first phase would witness complex and advanced naval exercises including surface, anti-submarine and anti-air warfare operations, cross-deck flying and weapon firing exercises, officials said.

“The exercise, being conducted as a ‘non-contact, at sea only’ in view of COVID-19 pandemic, will showcase the high-levels of synergy and coordination between the friendly navies, which is based on their shared values and commitment to an open, inclusive Indo-Pacific and a rules-based international order,” said the official.

The decision to invite Australia was announced by the government on October 19.

“As India seeks to increase cooperation with other countries in the maritime security domain and in the light of increased defence cooperation with Australia, Malabar 2020 will see the participation of the Australian Navy,” the defence ministry announced in a statement.

The exercise comes after the Quad Foreign Ministers meeting in Tokyo on October 6 and follows the India-US 2+2 dialogue on October 26-27.

The last time Australia got invited as a non-permanent partner by India for Malabar was in 2007, prompting Beijing to issue a demarche to India, US, Japan and Australia seeking details of the exercise in the context of Quad initiative.

<https://www.hindustantimes.com/india-news/quad-set-to-kick-off-malabar-drills-in-bay-of-bengal-china-to-keep-watch/story-JjYwqTLzRcmyV0o9SKJpjK.html>

# The Statesman

Fri, 30 Oct 2020

## India, China to hold 8th military talks next week

*Earlier, the talks had ended in deadlock with no sign of de-escalation of force along the Line of Actual Control (LAC) even with winter setting in, leaving soldiers exposed to minus 30-degree Celsius temperature*

Military delegates from India and China will hold talks for the eighth time next week to resolve the border dispute in Eastern Ladakh.

Earlier, the talks had ended in a deadlock with no sign of de-escalation of force along the Line of Actual Control (LAC) even with winter setting in, leaving soldiers exposed to minus 30-degree Celsius temperature.

This time, Lieutenant General P.G.K. Menon will lead the discussions from the Indian side, while Joint Secretary from the Ministry of External Affairs, Navin Srivastava, will also be part of the delegation.

Menon took over the charge of the 14 Corps Commander in mid-October after his predecessor Lieutenant General Harinder Singh was transferred to the Indian Military Academy (IMA) where he would be in charge of training the future generations of Army officers.

Both the countries' top military commanders met seven times in a bid to resolve the six-month-long standoff along the LAC. The last meeting took place on October 12 and that too ended in a deadlock. After the meeting, the Indian Army had issued a statement saying that the two sides had a sincere, in-depth and constructive exchange of views on disengagement along the Line of Actual Control in the Western Sector of India-China border areas.

"They were of the view that these discussions were positive, constructive and had enhanced the understanding of each other's positions," the Indian Army had said.

The force had also said that both sides agreed to maintain dialogue and communication through military and diplomatic channels, and arrive at a mutually acceptable solution for disengagement as early as possible. On August 30, India had occupied critical mountain heights on the southern bank of the Pangong Lake like Rechin La, Rezang La, Mukpari and Tabletop that were unmanned till then. India has also made some deployments near the Blacktop. The movement was carried out after the Chinese troopers tried to make a provocative military move.

Now, dominance at these 13 peaks allows India to dominate the Spangur Gap under Chinese control and also the Moldo garrison on the Chinese side.

India and China are engaged in a six-month-long standoff along the LAC. Despite several levels of dialogue, there has not been any breakthrough and the deadlock continues.

<https://www.thestatesman.com/india/india-china-hold-8th-military-talks-next-week-1502932587.html>



Indian Army stocks up for long haul in eastern Ladakh. (IANS)



## **Is BECA a game changer for India? Part 2**

*By Dr Anil Kumar Lal*

### **Finally BECA**

The BECA is all about the exchange of Geo-spatial Intelligence (GEOINT) information for the military as well as the government. For the collection and processing of GEOINT information, the US shall exchange technical information related to the specifications, methods, and formats. This information is very precise and accurate.

On the other hand, the Indian Army's Survey General's shortcomings in providing accurate maps even for regions within India has not been found to be adequate for digitisation and data fusion related work. The conversion of previously collected Geo data prior to World Geodetic Survey 1984(WGS84), i.e. Reference Datum implementation was slow and error-prone in implementation. The GIS systems advanced at a rapid technological pace, while Military Survey General could not keep pace with such advancements, rendering their database inaccurate and bereft of correction updates. US GEOINT information made available under the aegis of BECA Agreement shall now fill this gap.

It allows both countries to share all kinds of military information such as geomagnetic and gravity data, maps, nautical and aeronautical charts, commercial and other unclassified imagery. While most information shared will be unclassified, there are provisions for sharing classified information like sensitive satellite and sensor data, with safeguards to prevent it from being shared with any third party. BECA enables supply of high-end equipment as well as real-time intelligence and information, which will allow India to harness the American geo-spatial information and cause fusion of data with Indian Fire Support Systems so as to hit enemy targets with pinpoint accuracy. The signing of these agreements is mandatory, under American law, for the US to enter military alliances related to the export of sensitive equipment.

In view of these three pacts, Indian Defence planners will need to review their Long term Integrated Perspective Plans (LTIPP) again although the 'LTIPP' was revised only in 2019. A greater focus towards defence organisational reforms and some serious investments in multi-functional C4I systems at Tri-services level could be some of the force multipliers needed to be planned for. The real time Information assimilation now available to the Indian Military will outclass the present capabilities of the PLA. A superior C4I2 can be exploited only, if instantaneous fusion of data can occur with the firing weapons to neutralize targets through Indian Precision Guided Munitions (PGMs) and long-range artillery/rockets/missiles. Thus the need for organisational reforms and absorption of niche technologies in the Indian Fire Support platforms and systems.

### **BECA Will Offset Asymmetry with China (to some extent).**

All PLA deployments in Tibet across the LAC will become transparent to the Indian defence planners in real time. This is because the US Space Command is operational and has a global watch in real time due to its extensive satellite network. The US space domination is beyond the reach of China. This information ascendancy gives them a distinct edge over any adversary in the sky and space. Space thus becomes the eye for all types of operations, especially engaging long distance targets with own missiles and aircrafts with pinpoint accuracy. In fact, the C4I2 concept cannot function without this capability. Whereas, India was lagging behind China in this aspect. A deep study of China's new war fighting doctrine shows that it is heavily dependent on this aspect of Information domination for enabling pin point neutralization of the defender's strategic assets before commencement of their phase 3 (assault) operations. In fact with better information domination and accurate geospatial digitised 12 figure coordinates now, India will be able to engage PLA strategic assets (There will be approximately a minimum of 36 strategic and hundreds

of tactical objectives in the Western Theatre Command) in real time as compared to China's existing capability of Near Real time (Means about 4 hours differential with real time). Secondly, India would be able to engage targets with point accuracy and thus expanding much lesser ammunition, which in turn will give simpler logistics. Further, this will result in 'In-Situ' destruction of PLA assets before they even are launched towards the adversary.

BECA Will Facilitate India's Offensive Capabilities in the Himalayas & IOR On the other hand, the 'BECA' will provide real time intelligence of depth locations of PLA formations and thus enabling the Offensive Formations to execute swiftly whilst armed with accurate information. This will allow deep manoeuvre of offensive formations behind the PLA depth locations thus encircling the PLA rather going for head on collisions. In case, if India decides to launch a strike corps with armoured formations, the reach would expand in direct proportion to the quality of information dissemination to the strike corps, which can manoeuvre to outflank enemy opposition. Coordination with Para drops and air force will be enhanced. While BECA, when applied in the sea domain and especially when operating as part of 'QUAD' operations in the IOR will give overwhelming superiority over PLAN.

### **BECA will telescope and leapfrog Indian Military Transformation**

The result of any future transformation is essentially based on two pillars capability. First capability is the Information domination phase before commencement of battle. Whichever side can obtain faster and accurate information of targets (like deployment of Formation Headquarters, Command and Communication centres and Fire support assets like artillery etc.) will have a distinct advantage. The second pillar capability is the ability of data fusion with the fire support systems combined with the ability to engage the discussed targets with PGMs. The total process of destruction of enemy form information domain to the fire and assault domain is one cycle. The second cycle would be again being a repetition of the first cycle depending on the remaining residual targets, which are still active. If any Force or military outfit can achieve this capability in real time, it can then be categorised as having achieved total transformation. The rest of the battle then boils down to mopping up and movement forward thereafter for further exploitation. The Indian military is presently sitting in the cusp of this transformation as it is led by a very competent strategic leadership under the newly appointed Chief of Defence Staff (CDS). In his interview with Nitin Gokhale he has already given the direction of the 'Great Indian Military Transformation' (GIMT) of not only adopting the process of 'Leap Frogging' but has mentioned that we will 'Pole-vault' and become a state of the art military very soon. Downsizing is the way forward as we re-create resources through lesser expenditures on reduced manpower. Beyond doubt, all the three pacts will synergise to make India a great military power in the region.

### **Overall Impact**

The cumulative impact of these three pacts will transform the Indian military to become a Network Centric force and thus in a way cause a 'Leap Frog' transformation so as to offset asymmetry with the PLA, PLAN and PLAAF. This in turn will give added deterrence to India's security and economic growth. In fact, these three pacts are already a game changer. Pakistan has shown concern that it will change the 'Balance of Power' status in the Asian security matrix and is direct threat to them. The Chinese have also reacted by saying that the US is laying discord in Asia. Beyond doubt, the creation of QUAD and the signing of these pacts, has created a 'Win-Win' geopolitical leverage both for the USA and India in the Indo-Pacific Region.

*(Disclaimer: Views expressed above are the author's own.)*

<https://timesofindia.indiatimes.com/blogs/rakshakindia/is-beca-a-game-changer-for-india-part-2/>

## Neutrons make structural changes in molecular brushes visible

They look like microscopic bottle brushes: Polymers with a backbone and tufts of side arms. This molecular design gives them unusual abilities: For example, they can bind active agents and release them again when the temperature changes. With the help of neutrons, a research team from the Technical University of Munich (TUM) has now succeeded to unveil the changes in the internal structure in course of the process.

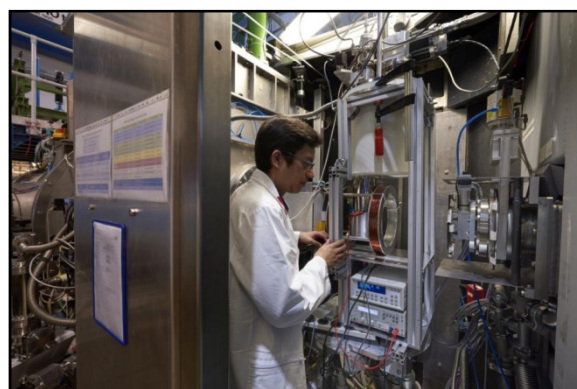
"The structure of the bottle-brush polymers, which are only nanometers in size, cannot be investigated using classical optical methods: It can be seen that an aqueous solution containing these polymers becomes turbid at a certain temperature. But why this is the case, and how the backbone and the side arms stretch out into in the water or contract, has not yet been clarified," reports Prof. Christine Papadakis.

There is a simple reason why scientists would like to know more about the inner life of bottle-brush polymers: The fluffy molecules, which consist of different polymer chains and abruptly change their solubility in water at a certain temperature, are promising candidates for a variety

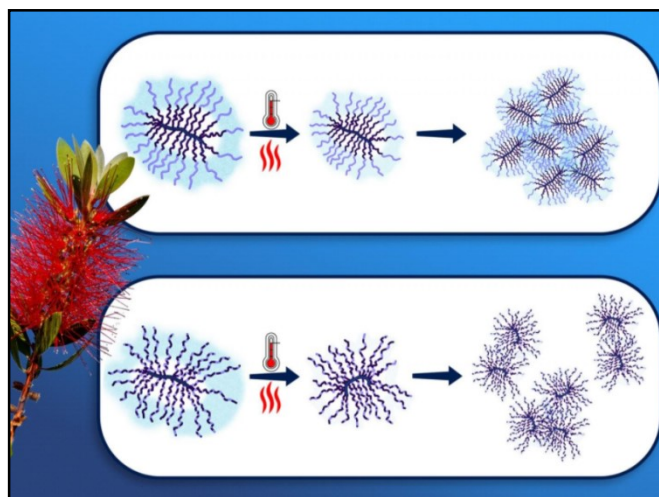
of applications.

For example, they could be used as catalysts to accelerate chemical reactions, as molecular switches to open or close tiny valves, or as transport media for medical drugs—the molecular brushes could thus bring pharmaceuticals to a center of inflammation and, because the temperature is elevated there, release them directly at the site of action.

However, the basic prerequisite for using the brush molecules is that their behavior can be programmed: Theoretically, chemists can use a combination of water-soluble and water-insoluble building blocks to determine precisely at what temperature the polymers clump together and the liquid in which they were just dissolved becomes cloudy. "In practice, however, you have to know exactly



Dr. Lester Barnsley, instrument scientist at Forschungszentrum Juelich, at the small-angle neutron scattering system KWS-1 of the Heinz Maier-Leibnitz Zentrum at the Heinz Maier-Leibnitz Research Neutron Source (FRM II) at the Technical University of Munich, where the bottle-brush polymers were investigated. Credit: Wenzel Schuermann/TUM



Upon heating thermoresponsive molecular brushes with propylene oxide/ethylene oxide copolymer side chains in aqueous solution split off water molecules. Depending on the structure of the polymer the molecular structure collapses at the cloud point, resulting in water-insoluble polymer coils, which form loose or compact clusters depending on the residual water content. Credit: Reiner Mueller/TUM

how and under what conditions the structure of the polymers changes if you want to design smart brush molecules," explains Papadakis.

### **Neutrons reveal their molecular inner life**

Together with her team in the Soft Matter Physics Group at the Technical University of Munich, she has now been able to visualize for the first time the changes that bottle-brush polymers with arms made of two different types of building blocks undergo when the temperature reaches the cloud point.

The scientists used neutron radiation from the Research Neutron Source Heinz Maier-Leibnitz (FRM II) on the campus Garching in a special instrument for small angle neutron scattering, which is operated by the Forschungszentrum Jülich

This method is particularly well suited for the investigation because neutrons are electrically neutral and therefore penetrate matter easily. There they are scattered by the atomic nuclei, which results in detailed information about the brush molecules. In combination with modern cryo electron microscopy, a detailed understanding of these molecules could be obtained.

### **When brushes clump together**

The thermoresponsive brush molecules studied by Papadakis' team were synthesized by chemists from the National Hellenic Research Foundation in Greece and the Technische Universität Dresden, respectively.

In the first step, the samples were dissolved in water, then gradually heated up to the cloud point and irradiated with neutrons. A detector monitored the scattered radiation. From the scattering signal, the researchers were able to deduce the structural changes.

Depending on the structure of the polymers, water molecules split-off already before the cloud point was reached. At the cloud point itself, the molecular structure of the polymers collapsed. What remained were water-insoluble polymer coils, which formed loose or compact clusters depending on the residual water content.

"The results will help to develop bottle-brush polymers suitable for practical use," the physicist is convinced. "If you know exactly how polymers change at the cloud point, you can optimize their chemical structure for different applications."

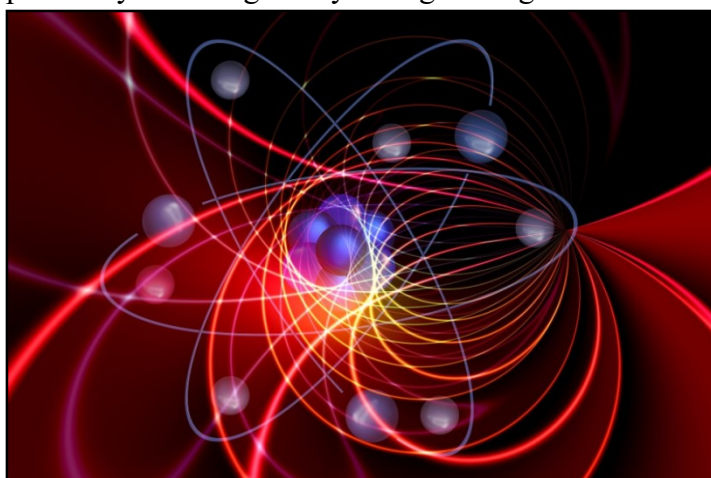
**More information:** Jia-Jhen Kang et al, A molecular brush with thermoresponsive poly(2-ethyl-2-oxazoline) side chains: a structural investigation, *Colloid and Polymer Science* (2020). DOI: [10.1007/s00396-020-04704-6](https://doi.org/10.1007/s00396-020-04704-6)

<https://phys.org/news/2020-10-neutrons-molecular-visible.html>

## Identifying biomolecule fragments in ionising radiation

When living cells are bombarded with fast, heavy ions, their interactions with water molecules can produce randomly scattered 'secondary' electrons with a wide range of energies. These electrons can then go on to trigger potentially damaging reactions in nearby biological molecules, producing electrically charged fragments. So far, however, researchers have yet to determine the precise energies at which secondary electrons produce certain fragments. In a new study published in *EPJ D*, researchers in Japan led by Hidetsugu Tsuchida at Kyoto University define for the first time the precise exact ranges in which positively and negatively charged fragments can be produced.

Through a better understanding of how biomolecules such as DNA are damaged by ionizing radiation, researchers could make important new advances towards more effective cancer therapies. Like molecular bullets, heavy ions will leave behind nanometre-scale tracks as they pass through water; scattering secondary electrons as they deposit their energy. These electrons may then either attach themselves to nearby molecules if they have lower energies, potentially causing them to fragment afterwards; or they may trigger more direct fragmentation if they have higher energies. Since water comprises 70% of all molecules in living cells, this effect is particularly pronounced in biological tissues.



Credit: Pixabay/CC0 Public Domain

In their previous research, Tsuchida's team bombarded liquid droplets containing the amino acid glycine with fast, heavy carbon ions, then identified the resulting fragments using mass spectrometry. Drawing on these results, the researchers have now used computer models incorporating random sampling methods to simulate secondary electron scattering along a carbon ion's water track. This allowed them to calculate the precise energy spectra of secondary electrons produced during ion bombardment; revealing how they related to the different types of glycine fragment produced. Through this approach, Tsuchida and colleagues showed that while electrons with energies lower 13 electronvolts (eV) went on to produce negatively charged fragments including ionized cyanide and formate, those in the range between 13eV and 100eV created positive fragments such as methylene amine.

**More information:** Hidetsugu Tsuchida et al, Relation between biomolecular dissociation and energy of secondary electrons generated in liquid water by fast heavy ions, *The European Physical Journal D* (2020). DOI: [10.1140/epjd/e2020-10172-x](https://doi.org/10.1140/epjd/e2020-10172-x)

<https://phys.org/news/2020-10-biomolecule-fragments-ionising.html>



## Study reveals robust performance in aged detonator explosive

In a large, statistically significant, one-of-a-kind study, researchers at Los Alamos National Laboratory have confirmed that the explosive called PETN (Pentaerythritol tetranitrate), stabilized with a polysaccharide coating, is resistant to changes in particle shape, size, and structure that can degrade detonator performance over time. The benefits of polysaccharide coating have long been known and studied by Los Alamos energetic material scientists.

"PETN is a common initiating explosive used extensively in commercial detonators and in the U.S. nuclear stockpile, but batch-to-batch variability has made it difficult for us to definitively show how it responds to aging," said Virginia Manner, an energetic materials chemist at Los Alamos and the project lead for the study.

It all began with a simple conversation between Manner and Daniel Preston about three years ago. At the time, Preston was a research and development engineer in the Detonation Science and Technology group at the Laboratory and wrestling with how to create a comprehensive study that connects PETN aging with detonator performance.

"So we brought together several groups and divisions at Los Alamos to create a very large-scale study that would put to rest all the questions we and others have had about PETN stability," said Manner.

Detonators are small devices that are typically used to initiate large explosive charges. These stable explosive materials need a "kick" to initiate an explosion, a shock wave above a specific speed and energy. The job of a detonator is to convert an input signal, usually electrical or percussive, into a high-pressure shock output. They are required to do so with very high reliability, accuracy, and safety, even after years of fielded service in adverse environments. Detonator designers rely on explosive materials that can survive aging effects with minimal impact to performance.

The research was published in the scientific journal *Propellants, Explosives, Pyrotechnics*. Many studies have been conducted on PETN stability during the aging process over the past 30 years at Los Alamos and other institutions, but challenges associated with production variability and the number of available detonators hampered the gathering of statistically significant testing data.

To solve this dilemma the research team treated a single source of PETN (enough to fill 2,000 detonators) with different stabilizers, thermally aged the resulting detonators, analyzed the powder characteristics and tested detonator function with a statistically significant sample size. The research highlighted in this particular paper included actual firing of about 400 of these detonators and other interrogations of the material to better understand its physical characteristics.

"We focused on four batches of PETN powder from the same stock using two stabilizers which have been applied for decades, polysaccharide and TriPEON," said Nick Lease, a scientist in the Laboratory's High Explosives Science and Technology group. A polysaccharide is a large molecule



In the firing control room, postdoctoral researcher Nicholas Lease (right), hands Research and Development Engineer Nathan Burnside (center), a flash drive to transfer data for analysis, after Maria Campbell, an explosives technician, fires a shot. Explosives Scientist Virginia Manner, (left) takes notes. Lease, Campbell, and Manner are from the Laboratory's High Explosives Science and Technology Group, while Burnside is from the Detonation Science and Technology Group. Credit: Los Alamos National Laboratory



made of simple sugars, like glucose. TriPEON is the chemical tripentaerythritol octanitrate, a common explosive stabilizer.

According to Geoff Brown, another collaborator, "The PETN is aged as a free-flowing powder and in modified exploding bridge wire detonators for one month at 75°C. The powder is then analyzed chemically using high-resolution imaging as well as particle size and surface area analysis techniques."

Additionally, "detonator performance was evaluated at a range of voltages to determine the energy needed to light the detonators, also known as threshold voltages. The time to output was also measured," said Nathan Burnside, a research and development engineer in the Detonation Science and Technology group.

Findings from the study indicate that aging significantly changes the surface area and particle size of unstabilized PETN, leading to increases in detonator function time.

"We monitor detonator health through function time—the time it takes from the initial bridgewire burst in the detonator, which initiates the PETN, to ultimately generate a shock at the output end of the detonator. This event should be as prompt as possible, and increases in time indicate eroding detonator health," said Preston.

Powders stabilized with TriPEON displayed less significant increases in function time, while powder stabilized with polysaccharide exhibited no aging effects, despite the high temperature aging.

"We have shown that PETN stabilized with a polysaccharide coating exhibits little to no change in powder characteristics during aging at elevated temperatures, in both free-flowing powder as well as pressed into low density commercially prepared detonator pellets," said Manner. "Interestingly, measured threshold voltages do not appear to be affected by the coarsening that occurs in the powder during aging, even with the unstabilized powder. Longer term studies are underway to determine if this will continue to be a trend."

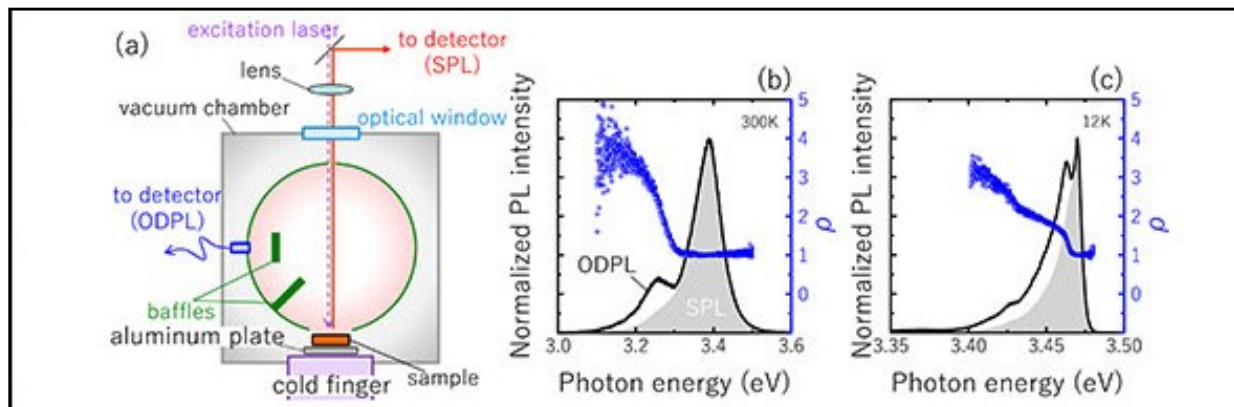
In a demonstration of the Laboratory's commitment to deliver on its core mission during the current pandemic, this project was completed under COVID-19 restrictions. Because the aging study was time sensitive, several members of the research team were given special approvals to be on site, and worked in labs using social distancing and masks, along with meticulous hygiene. They performed 25 to 50 explosive tests per day, disassembling approximately 30 detonators and imaging hundreds of parts.

Further work is underway to explore the effects of aging over various temperatures and longer timescales. The team at Los Alamos is composed of scientists and engineers from the Explosives Science and Technology, Detonation Science and Technology, Neutron Science and Technology, and Nuclear Security Production Integration groups.

**More information:** Nicholas Lease et al, The Role of Pentaerythritol Tetranitrate (PETN) Aging in Determining Detonator Firing Characteristics, *Propellants, Explosives, Pyrotechnics* (2020). DOI: [10.1002/prep.202000181](https://doi.org/10.1002/prep.202000181)  
<https://phys.org/news/2020-10-reveals-robust-aged-detonator-explosive.html>

## A new method to measure optical absorption in semiconductor crystals

Tohoku University researchers have revealed more details about omnidirectional photoluminescence (ODPL) spectroscopy—a method for probing semiconducting crystals with light to detect defects and impurities.



(a) A scheme of temperature variable ODPL spectroscopy. The spectra of ODPL and SPL as well as  $r$  (ODPL intensity divided by SPL intensity) measured at (b)  $T = 300$  K and (c)  $T = 12$  K. Credit: Kazunobu Kojima

"Our findings confirm the accuracy of ODPL measurements and show the possibility to measure optical absorption of crystals by the ODPL method, making the process much easier," says Tohoku University materials scientist Kazunobu Kojima.

Huge strides have been made in the development of highly efficient electronic and optical devices, e.g. ultraviolet, blue, and white light-emitting diodes (LEDs) as well as high-frequency transistors, that use nitride semiconductors—specifically aluminum gallium nitride (AlGaN), indium gallium nitride (InGaN), and gallium nitride (GaN).

GaN is a suitable material for power devices on account of its large bandgap energy, high breakdown field and high saturation electron velocity.

There is a strong need for manufacturers to be able to detect crystal defects and test their efficiency. Within such high quality crystals, the concentration of nonradiative recombination centers (NRC) serves as a good predictor of the crystals quality.

Annihilation spectroscopy, deep-level transient spectroscopy and photoluminescence (PL) spectroscopy are among the estimation techniques for detecting point defects which are the source of NRCs. PL spectroscopy is attractive because it requires no electrodes and contacts.

First proposed by Kojima and his research team in 2016, ODPL is a novel form of PL spectroscopy that measures PL intensity by using an integrating sphere to quantify the quantum efficiency of radiation in sample semiconductor crystals. It is non-touching, non-destructive and good for large-sized GaN wafers for room-lighting LEDs and transistors for electric vehicles. Yet, the origin of the two-peak structure formed in ODPL had remained elusive until now.

Kojima and his team combined ODPL and standard PL (SPL) spectroscopy experiments on a GaN crystal at various temperatures ( $T$ ) between 12 K and 300 K. The intensity ratio ( $r$ ) of the ODPL spectra to SPL spectra for the NBE emission of GaN showed a linearly decreasing slope for photon energy ( $E$ ) below a fundamental absorption edge energy ( $E_{abs}$ ). The slope obtained in  $r$  corresponded to the so-called Urbach-Martienssen (U-M) absorption tail, which is observed in many semiconductor crystals.

Therefore, the origin of the two-peak structure in the ODPL spectra around the NBE emission of the GaN crystal exists because of the U-M tail.

**More information:** K. Kojima et al, Urbach–Martienssen tail as the origin of the two-peak structure in the photoluminescence spectra for the near-band-edge emission of a freestanding GaN crystal observed by omnidirectional photoluminescence spectroscopy, *Applied Physics Letters* (2020). DOI: [10.1063/5.0028134](https://doi.org/10.1063/5.0028134)

**Journal information:** [Applied Physics Letters](https://phys.org/news/2020-10-method-optical-absorption-semiconductor-crystals.html)  
<https://phys.org/news/2020-10-method-optical-absorption-semiconductor-crystals.html>



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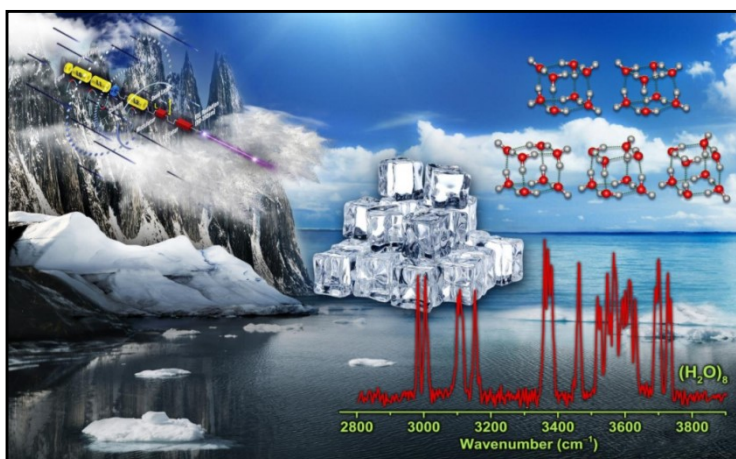
## Scientists discover new structures in the smallest ice cube

The freezing of water is one of the most common processes. However, understanding the microstructure of ice and its hydrogen-bonding networks has been a challenge.

The low-energy structure of a water octamer is predicted to be nominally cubic, with eight tri-coordinated water molecules at the eight corners of the cube. Such tri-coordinated water molecules have been identified at the surface of ice.

Only a few gas-phase studies have been achieved for experimental characterization of water octamer, and two nearly isoenergetic structures with  $D_{2d}$  and  $S_4$  symmetry are found.

This understanding now has changed. A research team led by Prof. Jiang Ling and Prof. Yang Xueming from the Dalian Institute of Chemical Physics (DICP) of the Chinese Academy of Sciences, in collaboration with Prof. Li Jun from Tsinghua University, revealed the coexistence of five cubic isomers in the smallest ice cube, including two with chirality.



The study was published in *Nature Communications* on October 28.

Prof. Jiang and Prof. Yang developed a method of infrared spectroscopy of neutral clusters based on a tunable vacuum ultraviolet free electron laser (VUV-FEL). This method created a new paradigm for the study of vibrational spectra of a wide variety of neutral clusters that could not be studied before.

"We measured infrared spectra of size-selected neutral water octamer using the VUV-FEL-based infrared scheme," said Prof. Jiang.

"We observed the distinct features in the spectra, and identified additional cubic isomers with  $C_2$  and  $C_i$  symmetry, which coexisted with the global-minimum  $D_{2d}$  and  $S_4$  isomers at finite temperature of the experiment," said Prof. Yang.

Prof. Li's team conducted quantum chemical studies to understand the electronic structure of the water octamer. They found that the relative energies of these structures reflect topology-dependent, delocalized multi-center hydrogen-bonding interactions.

The study demonstrated that even with a common structural motif, the degree of cooperativity among the hydrogen-bonding network created a hierarchy of distinct species. It provided crucial

information for fundamental understanding of the formation processes of cloud, aerosol, and ice, especially under rapid cooling.

Their findings provide a benchmark for accurate description of the water intermolecular potentials to understand the macroscopic properties of water, and stimulate further study of intermediate-ice structures formed in the crystallization process of ice.

**More information:** Gang Li et al, Infrared spectroscopic study of hydrogen bonding topologies in the smallest ice cube, *Nature Communications* (2020). [DOI: 10.1038/s41467-020-19226-6](https://doi.org/10.1038/s41467-020-19226-6)

**Journal information:** [Nature Communications](https://www.nature.com)  
<https://phys.org/news/2020-10-scientists-smallest-ice-cube.html>

## COVID-19 Research News



*Fri, 30 Oct 2020*

# Face mask aims to deactivate virus to protect others

In the pandemic, people wear face masks to respect and protect others—not merely to protect themselves, says a team of Northwestern University researchers.

With this in mind, the researchers developed a new concept for a mask that aims to make the wearer less infectious. The central idea, which received support from the National Science Foundation through a RAPID grant, is to modify mask fabrics with anti-viral chemicals that can sanitize exhaled, escaped respiratory droplets.

By simulating inhalation, exhalation, coughs and sneezes in the laboratory, the researchers found that non-woven fabrics used in most masks work well to demonstrate the concept. A lint-free wipe with just 19% fiber density, for example, sanitized up to 82% of escaped respiratory droplets by volume. Such fabrics do not make breathing more difficult, and the on-mask chemicals did not detach during simulated inhalation experiments.

The research will be published on Oct. 29 in the journal *Matter*.

### Importance of protecting others

"Masks are perhaps the most important component of the personal protective equipment (PPE) needed to fight a pandemic," said Northwestern's Jiaying Huang, who led the study. "We quickly realized that a mask not only protects the person wearing it, but much more importantly, it protects others from being exposed to the droplets (and germs) released by the wearer.

"There seems to be quite some confusion about mask wearing, as some people don't think they need personal protection," Huang added. "Perhaps we should call it public health equipment (PHE) instead of PPE."

Huang is a professor of materials science and engineering in Northwestern's McCormick School of Engineering. Graduate student Haiyue Huang and postdoctoral fellow Hun Park, both members of Huang's laboratory, are co-first authors of the paper.

"Where there is an outbreak of infectious respiratory disease, controlling the source is most effective in preventing viral spread," said Haiyue Huang, a 2020 Ryan Fellowship Awardee. "After they leave the source, respiratory droplets become more diffuse and more difficult to control."

Although masks can block or reroute exhaled respiratory droplets, many droplets (and their embedded viruses) still escape. From there, virus-laden droplets can infect another person directly

or land on surfaces to indirectly infect others. Huang's team aimed to chemically alter the escape droplets to make the viruses inactivate more quickly.

To accomplish this, Huang sought to design a mask fabric that: (1) Would not make breathing more difficult, (2) Can load molecular anti-viral agents such as acid and metal ions that can readily dissolve in escaped droplets, and (3) Do not contain volatile chemicals or easily detachable materials that could be inhaled by the wearer.

After performing multiple experiments, Huang and his team selected two well-known antiviral chemicals: phosphoric acid and copper salt. These non-volatile chemicals were appealing because neither can be vaporized and then potentially inhaled. And both create a local chemical environment that is unfavorable for viruses.

"Virus structures are actually very delicate and 'brittle,'" Huang said. "If any part of the virus malfunctions, then it loses the ability to infect."

Huang's team grew a layer of a conducting polymer polyaniline on the surface of the mask fabric fibers. The material adheres strongly to the fibers, acting as reservoirs for acid and copper salts. The researchers found that even loose fabrics with low-fiber packing densities of about 11%, such as medical gauze, still altered 28% of exhaled respiratory droplets by volume. For tighter fabrics, such as lint-free wipes (the type of fabrics typically used in the lab for cleaning), 82% of respiratory droplets were modified.

Huang hopes the current work provides a scientific foundation for other researchers, particularly in other parts of the world, to develop their own versions of this chemical modulation strategy and test it further with viral samples or even with patients.

"Our research has become an open knowledge, and we will love to see more people joining this effort to develop tools for strengthening public health responses," Huang said. "The work is done nearly entirely in lab during campus shutdown. We hope to show researchers in non-biological side of science and engineering and those without many resources or connections that they can also contribute their energy and talent."

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<https://phys.org/news/2020-10-mask-aims-deactivate-virus.html>

