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समाचार पत्रों से चयित अंश Newspapers Clippings

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4 missile tests, 1 deployed near LAC in 40 days as India shows intent

HT learns that a limited number of Nirbhay missiles have already been deployed in response to the Chinese build-up in Tibet and Xinjiang

By Shishir Gupta

New Delhi: The government recently approved the induction and deployment of the 700-km range surface-to-surface supersonic Shaurya strategic missile even as there has been progress in the development of the 5,000-km range K-5 submarine-launched ballistic missile, people familiar with the matter said on condition of anonymity. They added that the 800-km range subsonic (below the speed of sound) Nirbhay cruise missile will be tested in the next couple of weeks and be inducted into both Indian Army and Navy shortly after.

HT learns that a limited number of Nirbhay missiles have already been deployed in response to the Chinese build-up in Tibet and Xinjiang.

The tests and the deployments need to be seen in the context of the ongoing impasse between Indian and Chinese troops at the Line of Actual Control.

In the past month, the government has tested the Hypersonic Technology Demonstrator Vehicle (HSTDV), the pre-cursor to building missiles that can travel at a minimum of five times the speed of sound (September 7), the extended range version of the supersonic cruise missile BrahMos (on September 30; with a range of 400 km, up from the existing 290 km); the nuclear-capable Shaurya supersonic missiles that can travel at twice to thrice the speed of sound (October 3); and the supersonic missile assisted release of torpedo that targets submarines (October 5). BrahMos is also a supersonic missile.

The Shaurya missile is the land version of submarine launched BA-05 missile and has been developed by the Defence Research and Development Organization (DRDO). The land version was discreetly tested for the final time before induction and as part of user trials from Balasore on October 3. It will be soon deployed at locations identified by the Indian Strategic Forces Command under guidance from National Security Council. The missile has a warhead weighing around 160 kilograms

According to top missile experts, Shaurya is a delivery system stored in a composite canister for rapid deployment and minimum interaction with the elements. The strategic missile flies within the atmosphere at a height of 50 kilometres. The experts added that the government's decision to go for land version is significant as the missile can be launched by a single vehicle.

DRDO is also making rapid strides in the development of 5,000 km version of the submarine launched ballistic missile of SLBM. With a range equivalent to Agni-5 land based ballistic missile, the K-5 will be deployed on-board the Arihant class of nuclear submarines. While the missile scientists are tight-lipped about the K-5 SLBM, the weapon system is expected to be tested in the



next 15 months and subsequently deployed on the INS Arihant and the INS Arighat a new class of heavier submarine which is under harbor trials. INS Arighat is expected to be commissioned within the next six months and INS Arihant is already deployed in forward positions

Analysts said that coming at a time when India is engaged with a belligerent Chinese Army in the Ladakh sector, the testing and deployment of short-range delivery platforms clearly conveys the Modi Government's intention of not backing down to any aggression or cartographical expansion plan of any adversary in the neighbourhood.

<https://www.hindustantimes.com/india-news/india-bolsters-strength-with-missile-tests-deployment/story-LcaxZngN0mvJ31JxTvJXQO.html>



Thu, 08 Oct 2020

Won't be first to withdraw forces from LAC, asserts India

By Rahul Dutta

New Delhi: Even though both the sides have agreed not to send more troops to the Line of Actual Control (LAC) in Ladakh, India is not willing to take any chances and will wait for the Chinese to first begin the withdrawal from the stand-off sites before thinning out its own troops. This even as India has carried out a succession of tests of missiles in the last few weeks and minced no words in its posturing against China, which is a new assertive trait.

The real intent of the Chinese will come to the fore in the seventh round of Corps Commander level talks scheduled for October 12. In the sixth round on September 21, both the commanders agreed not to send more troops to the LAC as a confidence building measures.

While relative calm prevails at the LAC since external affairs minister S Jaishankar's bilateral meeting with his Chinese counterpart Wang Yi in Moscow on September 10 and the Corps Commander level parleys, the Indian security establishment is watching the situation closely, sources said here on Wednesday.

There is no question of pulling out additional troops now deployed in the depth areas since the stand-offs began in mid May till the Chinese take the first step and pull back, officials said. Making it clear that there is a big trust deficit, they also said the forces are geared to meet any challenge.

Not letting its guard down, at least four missile tests were conducted in the past few weeks including the 700-km-range Shaurya missile. Capable of carrying 200 to 1,000 kg nuclear payload, it is the land version of submarine launched K-15 missile. Both the missiles are developed by the Defence Research and Development Organisation (DRDO).

The important breakthrough in a test off Balasore in Odisha comes as India has already deployed its Brahmos supersonic cruise missile besides Nirbhay and Akash missiles at strategic locations close to the LAC. The preventive move came after China positioned its strategic missiles in the Tibet region in the last few weeks besides enhancing its troop strength and fighter jet fleet in the volatile region.

Officials rate Shaurya as one of the top 10 missiles in the world in its class with its high performance navigation and guidance systems, efficient propulsion systems, sophisticated control technologies and canisterised launch.

The missile can be launched from silos and canisters mounted on a truck and fixed on the ground, they said adding that it can be easily moved around. A truck itself can become a launching platform. Moreover, these missiles are difficult to be tracked by enemy satellites.

Keeping up the tempo of tests, scientists some weeks back successfully tested Hypersonic Technology Demonstrator (HSTDV). The capability has now placed India the elite category of

nations having this capability. The US, Russia and China are other countries having these capabilities. The HSTDV gives India the flexibility of develop missile travelling at speed three to four times more than sound.

The indigenously designed and manufactured Brahmos supersonic cruise missile got a major boost after the successful test of its extended range system.

Now, these missiles with most of its components manufactured within the country can hit a target at more than 400 kms. The other important test included the supersonic missile assisted release of torpedo that targets submarines.

Sources said some more tests are in the offing like Nirbhay cruise missile with a range of nearly 800 km. A limited number of them are already deployed along with Akash and Brahmos at critical sites near the LAC.

<https://www.dailypioneer.com/2020/india/won---t-be-first-to-withdraw-forces-from-lac--asserts-india.html>

ThePrint

Thu, 08 Oct 2020

The SMART torpedo system and why DRDO is calling it ‘game changer’ in anti-submarine warfare

Defence experts say the SMART torpedo system will change anti-submarine warfare tactics to a large extent, if not completely

By Amrita Nayak Dutta

New Delhi: India successfully flight-tested its indigenously developed SMART torpedo system Monday, with the Defence Research and Development Organisation (DRDO) hailing it as a “game changer” in anti-submarine warfare.

According to a defence ministry statement, the Supersonic Missile Assisted Release of Torpedo or SMART was successfully tested from the Wheeler Island off the coast of Odisha. It added that all the mission objectives were perfectly met, which included the missile flight upto range and altitude, separation of the nose cone, release of torpedo as well as the deployment of Velocity Reduction Mechanism (VRM).

The test reportedly encompasses hybrid technology that helps to upgrade the present system and also increase the striking range.

A number of DRDO laboratories including DRDL, RCI Hyderabad, ADRDE Agra, NSTL Visakhapatnam have developed the technologies required for SMART.

ThePrint explains why the DRDO is calling it a ‘game changer’ in anti-submarine warfare and how it will significantly bolster the country’s maritime strategic capabilities.

What is SMART?

SMART is a missile-assisted release of lightweight Anti-Submarine Torpedo System for Anti-Submarine Warfare (ASW) operations far beyond torpedo range.

It takes off like a regular supersonic missile when launched from a warship or a truck-based coastal battery.

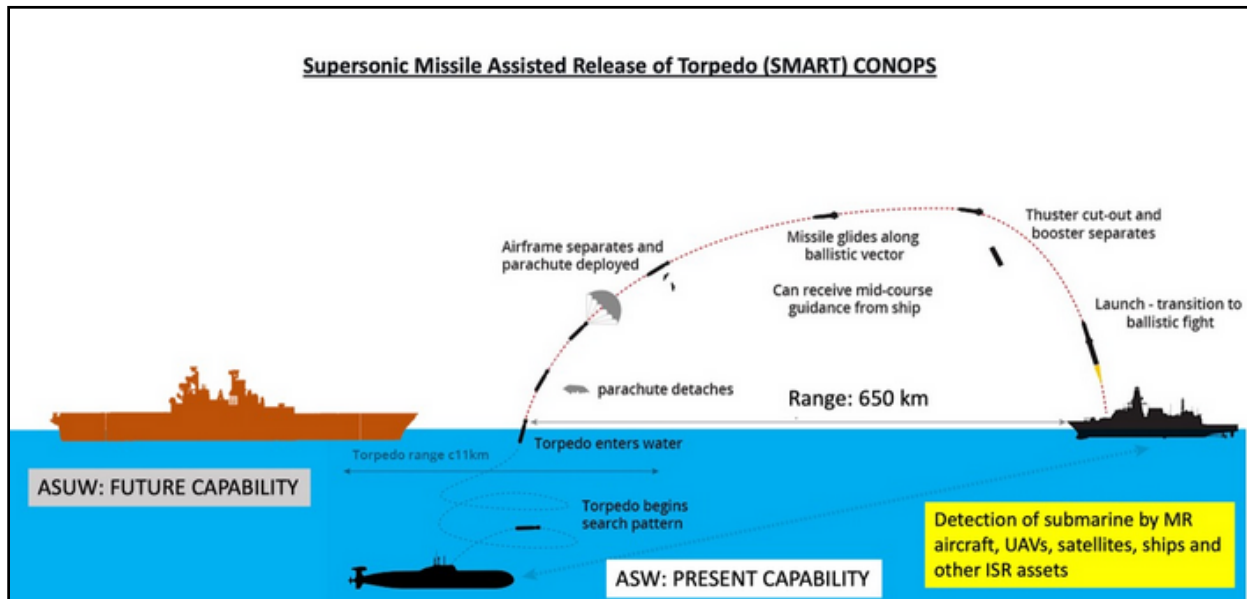


Supersonic Missile Assisted Release of Torpedo (SMART) successfully flight tested on Monday from Wheeler Island off the coast of Odisha | ANI | Twitter

Most of its flight in the air is covered at lower altitudes with two-way data link from the warship or an airborne submarine target detection system.

It is also provided the exact location of the hostile submarine to correct its flight path midway.

When it approaches close to a submerged submarine, the missile would eject the torpedo system into the water and the torpedo will start moving towards its target to hit the submarine.



The SMART system is being hailed as a game-changer | Photo: Sameer Joshi

According to defence writer Sameer Joshi, a former Indian Air Force pilot, the SMART system combines a solid fuel rocket with a lightweight torpedo (LWT) as its warhead.

“It decelerates and releases the torpedo over the designated target area, after which the torpedo operates normally and uses homing guidance to seek out enemy submarines,” he explained, while speaking to ThePrint.

Why is SMART torpedo system a ‘game changer’?

A senior Navy officer told ThePrint that the system will change anti-submarine warfare tactics to a large extent, if not completely.

“One of the most potent threats to surface ships is an undetected submarine and now with the SMART, we have removed the surface ship from the weapon danger zone of a submarine.”

The officer said the technology of SMART provides security of standoff ranges when prosecuting a submarine threat. “While the act of detecting submarines will still pose a challenge, but once detected, the SMART would be an unbridled threat to the submarine.”

Joshi said the SMART will give Indian warships and shore-based units a crucial standoff tool in the face of growing submarine threat from adversaries like China and Pakistan.

With its maximum range of 650 km, a first for such a class of weapon in the world, the DRDO has handed the Indian Navy a significant leap in engagement capabilities, he said.

“The Indian Navy theoretically now has a quick response measure to effectively saturate the Gwadar and Karachi ports at will, as well as blockade the Malacca strait at the first hint of Chinese submarines spotted by Indian satellites, MR aircraft, ships and other ISR assets,” Joshi said.

“It would only be logical to evolve the SMART to carry a heavy weight torpedo (HWT) towards interception of surface vessels in future. This will provide the navy with a potential capability to target enemy vessels threatening the sea lines of communication (SLOCs) in the Indian Ocean Region,” he said.

<https://theprint.in/defence/the-smart-torpedo-system-and-why-drdo-is-calling-it-game-changer-in-anti-submarine-warfare/518428/>

Explained: What is SMART test, and why it matters

This SMART system comprises a mechanism by which the torpedo is launched from a supersonic missile system with modifications that would take the torpedo to a far longer range than its own

By Sushant Kulkarni

Pune: On Monday, India successfully conducted the flight test of a Supersonic Missile Assisted Release of Torpedo (SMART) system developed by the Defence Research and Development Organisation (DRDO).

What is SMART system?

Torpedoes, self-propelled weapons that travel underwater to hit a target, are limited by their range. In the mid-2010s, DRDO undertook a project to build capacity to launch torpedoes assisted by missiles; Monday's was the first known flight test of the system.

This SMART system comprises a mechanism by which the torpedo is launched from a supersonic missile system with modifications that would take the torpedo to a far longer range than its own. For example, a torpedo with a range of a few kilometres can be sent a distance to the tune of 1000 km by the missile system from where the torpedo is launched.

The system also gives flexibility in terms of the missile system's launch platform, DRDO officials said. A number of DRDO laboratories including Defence Research and Development Laboratory (DRDL) and Research Centre Imarat (RCI), both in Hyderabad; Aerial Delivery Research and Development Establishment (ADRDE) in Agra; and Naval Science and Technology Laboratory (NSTL) Visakhapatnam have developed the technologies required for SMART.

What happened at the test?

It was conducted from Wheeler Island off the coast of Odisha around noon. DRDO has said all mission objectives including the missile's flight up to the designated range and altitude, separation of its nose cone, release of the torpedo and deployment of Velocity Reduction Mechanism (VRM) were met perfectly. An anti-submarine torpedo of the lightweight category was used.

The test follows another crucial test two days ago of the nuclear-capable Shaurya missile. Shaurya is a land-based parallel of the submarine-launched K-15 missile.

DRDO Chairman Dr G Satheesh Reddy said SMART is a game-changing technology demonstration in anti-submarine warfare. India's anti-submarine warfare capacity building is crucial in light of China's growing influence in the Indian Ocean region.

Assets of such warfare consist of deployment of submarines, specialised anti-submarine ships, air assets and state-of-the-art reconnaissance and detection mechanisms. The Navy's anti-submarine warfare capability got a boost in June after the conclusion of a contract for Advanced Torpedo Decoy System Maareech, capable of being fired from all frontline warships. India has been indigenously developing and building several anti-submarine systems and vessels in the recent past.

In January, DRDO conducted two successful tests of the K Family's K-4 missiles. The capability of launching nuclear weapons from submarine platforms has great strategic importance in light of the "no first use" policy of India. These submarines can not only survive a first strike by an adversary but also can launch a strike in retaliation. The nuclear-powered Arihant submarine



SMART launches on Monday.
(Twitter/@DefenceMinIndia)

and its class members in the pipeline are assets capable of launching missiles with nuclear warheads.

<https://indianexpress.com/article/explained/explained-what-is-smart-test-and-why-it-matters-6705811/>



Thu, 08 Oct 2020

P-8 , MH-60R Anti-Submarine Assets can make SMART Lethal : American Analysts

India says it has successfully tested a missile armed with a torpedo that could in theory strike enemy submarines more than 400 miles (643 kilometers) away. Dubbed the SMART (Supersonic Missile Assisted Release of Torpedo) system, the weapon was launched from Wheeler Island off the coast of India's Odisha state on Monday, the country's Defense Ministry said in a statement.

"This launch and demonstration is significant in establishing anti-submarine warfare capabilities," the statement said Monday. "All the mission objectives including missile flight up to the range and altitude, separation of the nose cone, release of Torpedo and deployment of Velocity Reduction Mechanism (VRM) have been met perfectly."

The use of the supersonic missile extends the range of the torpedo far beyond its normal parameters, the ministry said. "This will be a major technology breakthrough for stand-off capability in anti-submarine warfare," Indian Defense Minister Rajnath Singh said in a tweet. The missile carries a battery-powered torpedo with a 110 pound (50 kilogram) warhead and a range of about 12.5 miles (20 kilometers), according to Indian defense industry reports. Using the missile to take it close to its target extends its range to more than 400 miles (643 kilometers) at three times the speed of sound, the reports say.

Other nations, including Russia, the United States and Japan, have missiles or rockets that can carry a lightweight torpedo, but none come close to the reported range of the Indian weapon.

India has been boosting its anti-submarine warfare capabilities in recent years, acquiring state-of-the-art aircraft such as US-made Boeing P-8 reconnaissance planes and MH-60R Seahawk helicopters. Those aircraft could be detecting enemy submarines operating far from the India warships armed with the SMART system and transmitting targeting information back to them, significantly expanding the range for each Indian vessel.

That ability could be significant, especially as China expands its presence in the Indian Ocean. Beijing has built a significant, modern fleet of 60 submarines and has been sending them farther from its shores, according to the US Defense Department.

China's People's Liberation Army Navy (PLAN) has also been gaining port access around the Indian Ocean, including establishing its first overseas base in Djibouti on the Horn of Africa.

New attention has begun given to the decades-old rivalry between India and China in recent months after a deadly skirmish involving hand-to-hand combat between their forces along their border in the Himalayas earlier this year.

<https://idr.org/p-8-mh-60r-anti-submarine-assets-can-make-smart-lethal-american-analysts/>

India to deploy its newly tested, nuclear-capable hypersonic missile against China under direct command of PM Modi

Following the DRDO's testing of the "Shaurya" hypersonic nuclear-capable missile earlier this month, new reports hint that the missile has been approved by the Indian government for induction and deployment against China.

According to the Indian news agency Hindustan Times, the missile is set to be inducted with the Strategic Forces Command of the Indian Armed Forces, under the Nuclear Command Authority headed by Prime Minister Narendra Modi himself.

"According to top missile experts, Shaurya is a delivery system stored in a composite canister for rapid deployment and minimum interaction with the elements for a long period. The strategic missile flies at a supersonic speed of Mach 7, or 2.4 km per second, at a height of 50 km (within atmosphere) and hits the designated target at Mach 4," HT reported.

It also added that the missile has a warhead weighing around 160 kg, and can precisely strike targets upto 800 kilometers. The Hypersonic speed of the missile during its final phases enables it to evade any air defence systems.

The missile's capability of being fired from mobile TELs gives it a huge advantage over silo-based missiles, which gives the Indian government the flexibility of giving an adequate 'punch' to the hostile forces nearing its borders in case of an invasion. Considering its worsening ties with its two major neighbours Pakistan and China, the missile, as a tactical deterrence, gives leverage to the Indians.

The distance from New Delhi to Islamabad is about 690 kilometers, well within the range of Shaurya.

According to W. Selvamurthy, Chief Controller (Life Sciences and International Relations), DRDO, Shaurya had a big element of surprise because it could be kept in locations where the enemies would not be able to detect it.

"Besides, it cannot be detected by satellite imaging. It will surprise our adversaries and strengthen our strategic defence," Dr. Selvamurthy asserted, talking to The Hindu during the missile's test-firing in 2011.

The Defense Research and Development Organisation has been developing and testing weapon systems rapidly to enhance the capabilities of Indian Armed Forces especially when the country is facing a fierce standoff with China.

<https://eurasianimes.com/india-to-deploy-shaurya-hypersonic-missile-against-china-under-direct-command-of-pm-modi/>



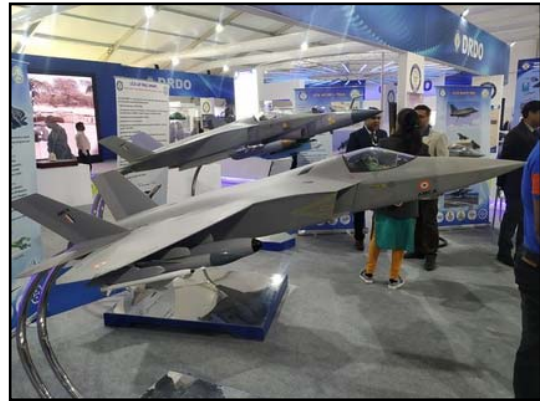
IAF plans to have 125 advanced combat jets

New Delhi: The Indian Air Force (IAF) is considering more numbers of the next generation stealth featured Advanced Medium Combat Aircraft (AMCA). The plan is to have at least 125 planes of the AMCA with two versions powered by separate engines.

During a press conference on Monday, Air Chief Marshal RKS Bhadauria said the force was looking for seven squadrons (some 125 jets) with two separate engines.

Sources said the first two squadrons of the fighters would be powered by an imported engine, the General Electric 414 with 90 KN thrust, same as the one used by US-made fighter jets made by Boeing.

The remaining five squadrons are likely to get an indigenous power plant with a greater thrust of 125 KN. A joint venture is being worked out with a foreign engine maker to jointly develop a new engine. A powerful engine will allow greater weapons carrying capacity and faster speed.



A model of the AMCA on display at DefExpo 2020.

According to the existing plan, the AMCA's first flight will be in 2027 and full production by 2029. The IAF, Hindustan Aeronautics Limited (HAL), the Aeronautical Development Agency (ADA) and Defence Research and Development Organisation (DRDO) are working on the AMCA.

The DRDO has tasked various labs for doing R&D on material, paint and structure. Separate studies are under way on flight control, avionics, aerodynamics, composite structure and general systems like brakes, hydraulics and fuel systems.

A super-cruise ability, which gives an aircraft capability to fly at supersonic speed, is being developed. The AMCA team is using geometric drawing for stealth by shaping the aircraft and designing it at such angles so as to deflect away maximum radar waves. It will use radar-absorbing material. The AMCA will be a single-seat, twin-engine, stealth all-weather multirole fighter aircraft.

AMCA: all-weather fighter aircraft

- The Advanced Medium Combat Aircraft will be a single-seat, twin-engine, stealth all-weather multirole fighter aircraft
- The 25-tonne jet will be capable of attaining super-cruise speed
- According to the existing plan, the AMCA's first flight will be in 2027 and full production by 2029

<https://www.tribuneindia.com/news/nation/iaf-plans-to-have-125-advanced-combat-jets-152029>

We are well equipped to handle Aero India show: K'taka CM

Bengaluru: Karnataka Chief Minister B.S. Yediyurappa on Wednesday assured the Union government that the state government would make the best possible preparations and also take precautions to conduct the 13th edition of Aero India show in February 2021.

Participating in the Ambassador's Round Table virtual summit regarding the 13th edition of the Aero India 2021, Yediyurappa conceded that it was indeed a unique challenge to both Karnataka and the Ministry of Defence to host this event at a time when the entire world is reeling under the global Covid-19 pandemic.



He quickly added that Karnataka had been the host state for the last 12 editions of Aero India and it was a proud moment for having been chosen again as the venue to host the 13th edition of Aero India 2021.

The biennial Aero India show is scheduled to be held from February 3 to 7, 2021.

The CM added that the standard operating procedures (SOPs) have been formulated such as strict adherence to the norms of thermal screening, sanitisation and social distancing to be observed at all locations inside and outside the venue in order to ensure the safety of international delegates, participating dignitaries and general public.

He claimed that Karnataka has adopted various proactive measures for containing the pandemic and was also ensuring a pandemic-free environment to host the Aero India 2021.

Yediyurappa observed that there has been a tremendous response from various players with almost 90 per cent of the space being provisionally booked or blocked for this event.

“Karnataka has already achieved a distinction in the Aerospace and Defence map of the country by catering to nearly 25 per cent of the aircraft and space industry in the country,” he said.

According to him, Karnataka also contributes nearly 65 per cent of the country's aerospace related exports. “More than 67 per cent of the helicopter and aircraft manufacturing for the defence sector is carried out in the state. This is besides being the first state in the country to formulate a dedicated aerospace policy,” he explained.

Aero India is a biennial air show and aviation exhibition held at the Yelahanka Air Force Station in Bengaluru.

The biennial event is jointly organised under the aegis of the Defence Ministry and Indian Air Force. Defence Research and Development Organisation (DRDO), Department of Space, the Union Civil Aviation Ministry and other organisations join hands to organise the Aero India show making it the largest air show in Asia.

The first edition of Aero India was held in 1996. Since then, the event has gradually earned international recognition, and has seen increased participation from exhibitors.

The 12th edition of Aero India that was held from February 20 to 24, 2019 in Bengaluru, was launched with the theme of the event – Runway to a Billion Opportunities.

The logo of the exhibition was inspired by the Tejas Light Combat Aircraft (LCA). In this edition, for the first time, the defence and civil aviation segments have been combined into a holistic event with the co-involvement of the defence and civil aviation ministries. More than 600 local companies and 200 overseas companies will participate in the air show. (IANS)

<https://ommcomnews.com/india-news/we-are-well-equipped-to-handle-aero-india-show-ktaka-cm>



Thu, 08 Oct 2020

Amid LAC tension with China, government considering 'Made in India' carbines for defence forces

Amid the ongoing standoff with China at the Line of Actual Control (LAC) in Ladakh, the government is considering to procure 'Made in India' carbines for meeting their urgent requirement of the armed forces

Edited By Ritesh K Srivastava

New Delhi: Amid the ongoing standoff with China at the Line of Actual Control (LAC) in Ladakh, the government is now considering to procure 'Made in India' carbines for meeting the urgent requirements of the armed forces.

The government is believed to be considering this option amid indications that its proposal for acquisition of imported carbines is unlikely to fructify, according to news agency ANI.

The move is important since the Indian Army has been on a lookout for the carbine - an infantry weapon used for close quarter battles - for many years now.

"The carbine produced by the Ordnance Factory Board at its facility in Ishapore in West Bengal has been offered to the armed forces who are now evaluating it for acquisition," government sources were quoted as saying by ANI.

Preliminary trials of the weapon were also carried out a short while ago by officials concerned dealing with the acquisition of weapon systems for the three armed forces.

The scope for consideration of buying indigenous carbine came up after it started emerging that the forces would not be acquiring the carbines from the foreign country which has exported it to only a few countries and that too in very small quantities.

The issue of acquiring these carbines from abroad had been stuck for close to two years now as the matter was referred to a high-level committee for decision by the Defence Acquisition Council under the first NDA government.

The overall requirement of the armed forces is for almost 3.5 lakh carbines but they wanted to acquire around 94,000 of these weapons through import route under fast track procedures.

If selected, the OFB carbine will undergo rigorous testing and initially be inducted in limited numbers only by the defence forces.

Efforts to acquire the CQB carbines since 2008 have not materialised. The initial lot of carbines acquired by the forces is expected to be provided to troops deployed on the China front.



Prime Minister Narendra Modi government recently cleared the second batch of the Sig Sauer assault rifles which would be provided to the troops deployed against the Chinese forces in Eastern Ladakh and other areas. (With ANI inputs)

<https://zeenews.india.com/india/amid-lac-tension-with-china-government-considering-made-in-india-carbines-for-defence-forces-2315454.html>



Thu, 08 Oct 2020

वायुसेना का 88वां स्थापना दिवस आज, चीन से तनाव के बीच हिंडन एयरबेस पर दिखेगी एयरफोर्स की ताकत

एयरफोर्स के स्थापना दिवस के मौके पर कुल 56 एयरक्राफ्ट इस बार हिंडन में हिस्सा ले रहे हैं। इसमें राफेल, सुखोई, मिग29, मिराज, जगुआर और तेजस शामिल हैं

हिंडन: भारतीय वायुसेना का 88वां स्थापना दिवस आज मनाया जाएगा। एलएसी पर चीन के खिलाफ अपनी ताकत का परिचय देने के बाद भारत की वायु शक्ति की गर्जना आज राजधानी दिल्ली के करीब हिंडन एयर बेस पर देखने को मिलेगी। कुल 56 एयरक्राफ्ट इस बार हिंडन में हिस्सा ले रहे हैं। इसमें राफेल, सुखोई, मिग 29, मिराज, जगुआर और तेजस शामिल हैं। इस दौरान हिंडन एयरबेस पर जबरदस्त फ्लाई पास्ट देखने का मौका मिलेगा जिसमें मुख्य आकर्षण का केंद्र होगा राफेल लड़ाकू विमान होगा। सुबह आठ बजे से कार्यक्रम की शुरुआत होगी।

आज हिंडन एयरबेस पर फ्लाई पास्ट की शुरुआत 'आकाशगंगा' यानि आसमान से पैरा-जंप से होगी। इस पैरा-जंप में वायु-सैनिक ट्रांसपोर्ट एयरक्राफ्ट से पैराशूट कर जरिए जंप लगाएंगे। उसके बाद निशान-टोली के साथ वायुसैनिक मार्च पास्ट करेंगे। इसके बाद वायुसेना के हेवी-लिफ्ट हेलीकॉप्टर्स मी-17वी5 के हिंडन एयरबेस के ऊपर उड़ान से फ्लाई पास्ट की शुरुआत होगी।

मी-17 के बाद आएंगे हाल ही में अमेरिका से लिए हेवीलिफ्ट हेलीकॉप्टर्स, चिनूक। चिनूक हेलीकॉप्टर्स फील्ड-गन्स यानि तोप और दूसरे हेवी सामान ले जाते हुए दिखाई पड़ेंगे। उसके बाद सी-17 ग्लोबमास्टर और आईएल-76 मिलिट्री ट्रांसपोर्ट एयरक्राफ्ट आएंगे।

हिंडन एयरबेस पर भी सी-130 जे सुपर हरक्युलिस ट्रांसपोर्ट विमान स्टेटिक-डिस्प्ले में दिखाई पड़ेगा। इन सभी हेलीकॉप्टर्स और मालवाहक विमानों का इस्तेमाल हाल ही में एलएसी पर चीन से चल रहे टकराव के दौरान बड़ी तादाद में सैनिकों, टैंक तोप और दूसरे सैन्य साजो सामान को बेहद तेजी से फॉरवर्ड लोकेशन पर भेजने के लिए इस्तेमाल किया गया था।

हिंडन एयरबेस के स्टेटिक डिस्प्ले में भी राफेल को सबसे बीच में स्थान दिया गया है। फ्लाई पास्ट की दो फॉर्मेशन्स में भी राफेल को जगह दी गई है। पहली ही 'विजय' और दूसरी है 'ट्रांसफॉर्मर'। विजय फॉर्मेशन में राफेल के साथ मिराज-2000 और जगुआर फाइटर जेट्स होंगे तो ट्रांसफॉर्मर में स्वदेशी एलसीए-तेजस और सुखोई लड़ाकू विमान होंगे।



आज हिंडन एयरबेस पर स्वदेशी फाइटर जेट, तेजस भी राफेल के साथ आसमान में करतब करता और गर्जना भरते नजर आएगा। इसके अलावा सुखोई, मिग-29, मिराज 2000 और जगुआर भी आसमान में भारत की हवाई ताकत का परिचय देंगे। स्टेटिक डिस्प्ले में अपाचे अटैक हेलीकॉप्टर, आकाश मिसाइल सिस्टम, टोही विमान अवैक्स और स्वदेशी रडार सिस्टम, रोहिणी भी हिंडन एयरबेस पर दिखाई पड़ेंगे। दर्शकों के लिए खास सारंग हेलीकॉप्टर और सूर्यकिरण जेट टीम भी एयरोबेटिक्स करते दिखाई पड़ेंगे।

<https://www.abplive.com/news/india/hindon-88th-indian-air-force-day-today-rafale-will-fly-in-sky-1591593>



Thu, 08 Oct 2020

Indian Air Force Day 2020: Know why event is celebrated on October 8; date and time

IAF's frontline warplanes like Rafale, Su-30MKI, Apache, Tejas, 'Gajraj' will showcase its lethal firepower
Edited By Ananya Das

Highlights

1. *The Indian Air Force (IAF) Day is celebrated every year on October 8 and on Thursday the IAF will proudly observe its 88th anniversary.*
2. *On the occasion, a scintillating air display by various aircraft will be the hallmark of the Air Force Day Parade cum Investiture Ceremony at Air Force Station Hindan.*
3. *IAF's frontline warplanes like Rafale, Su-30MKI, Apache, Tejas, 'Gajraj' will showcase its lethal firepower.*

The Indian Air Force (IAF) Day is celebrated every year on October 8 and on Thursday the IAF will proudly observe its 88th anniversary. On the occasion, a scintillating air display by various aircraft will be the hallmark of the Air Force Day Parade cum Investiture Ceremony at Air Force Station Hindan (Ghaziabad) near Delhi.

On the occasion, Union Defence Minister Rajnath Singh wished the air warriors and their families. Taking to Twitter, he wrote, "I am confident that the IAF will always guard the nation's skies, come what may. Here's wishing you blue skies and happy landings always."

IAF's frontline warplanes like Rafale, Su-30MKI, Apache, Tejas, 'Gajraj' will showcase its lethal firepower. 56 aircraft, including 19 fighters and seven transport aircraft along with 19 helicopters, would be taking part in aerial display during this year's Air Force Day Parade, according to a press release by the IAF.

The Rafale fighter aircraft would fly in the 'Vijay' formation along with the Jaguars and then in the 'Transformer' formation with the Sukhoi-30 MKI and Light Combat Aircraft (LCA) Tejas fighter aircraft during the IAF Day parade this year.

Date and time of the event: The Indian Air Force Day will be celebrated on October 8 (Thursday) at the Hindon Base in Ghaziabad. The ceremony usually starts at 8 am and continues till 11 am.

Why Indian Air Force Day is celebrated on October 8? The IAF was founded on October 8, 1932, and the force has participated in several crucial wars and landmark missions. It was officially established as an auxiliary air force of the British Empire which honoured India's aviation service during World War II with the prefix Royal. After India gained independence from the United



Kingdom in 1947, the name Royal Indian Air Force was kept and served in the name of Dominion of India. With the government's transition to a Republic in 1950, the prefix Royal was removed.

Since 1950 the IAF has been involved in four wars with neighbouring Pakistan and one with the People's Republic of China. Other major operations undertaken by the IAF include Operation Vijay, Operation Meghdoot, Operation Cactus and Operation Poomalai. The IAF's mission expands beyond engagement with hostile forces, with the IAF participating in United Nations peacekeeping missions.

The IAF is the air arm of the Indian Armed Forces and its primary mission is to secure Indian airspace and to conduct aerial warfare during armed conflict. Its complement of personnel and aircraft assets ranks fourth amongst the air forces of the world. During the event, IAF chief and senior officials of the three armed forces are present. An air show by various aircraft is displayed by the pilots.

The President of India holds the rank of Supreme Commander of the IAF. The Chief of Air Staff, an air chief marshal, is a four-star officer and is responsible for the bulk of operational command of the Air Force. There is never more than one serving ACM at any given time in the IAF.

However, this year the events related to Air Force Day celebrations have been scaled down due to ongoing COVID-19 pandemic. The regular scheduled events related to veterans at Delhi/NCR has been cancelled.

An official statement read, "Events related to Air Force Day celebrations have been scaled down due to ongoing COVID-19 Pandemic. Accordingly, the regular scheduled events related to veterans at Delhi/NCR stand cancelled."

<https://zeenews.india.com/india/indian-air-force-day-2020-know-why-iaf-event-is-celebrated-on-october-8-date-and-time-2315590.html>

The Telegraph *online*

Thu, 08 Oct 2020

PoK missile sites, with China help: Report

Increased Chinese air activities have also been observed in the disputed region coinciding with the military standoff in eastern Ladakh: Sources

Chinese troops are conducting joint patrols with Pakistan's army in Pakistan-occupied Kashmir, and Beijing is helping set up multiple surface-to-air missile launch sites and a missile defence system in the region, sources in the security establishment said, quoting from an intelligence report.

Increased Chinese air activities have also been observed in PoK coinciding with the military standoff between India and China in eastern Ladakh, the sources said.

"The latest intelligence report suggests that China is helping Pakistan set up sites for surface-to-air missiles in PoK, and that the two armies are holding joint patrols," an Intelligence Bureau official attached to the Union home ministry said.

"We have been witnessing closer military and economic cooperation between the two countries amid the border standoff between India and China since May."

The Indian Air Force chief, Air Marshal R.K.S. Bhadauria, had on Monday told a news conference that there was nothing to suggest a "collusive threat" but highlighted how the Chinese and Pakistani armies were carrying out joint exercises.



Air Marshal RKS Bhadauria had on Monday told a news conference that there was nothing to suggest a "collusive threat" but highlighted how the Chinese and Pakistani armies were carrying out joint exercises. PTI

“We are aware they are cooperating closely. There is a significant threat but so far there is no such indication that they are colluding for a two-front war,” Bhadauria had said.

On India’s capability to withstand a two-front war, Bhadauria had said that amid an “emerging threat scenario in our neighbourhood and beyond”, the country was prepared for any conflict it might face.

Among the military infrastructure projects going on at several PoK locations with China’s help, “construction for the installation of a surface-to-air missile defence system is being carried out at Pauli Pir near Lasadanna Dhok of PoK”, a security official said.

He said the intelligence report had also spoken of joint reconnaissance exercises between Chinese and Pakistani troops in forward PoK locations such as Deolian and Jura.

“We have noticed increased Chinese air activities in PoK, with Chinese refuelling aircraft having landed at Skardu in PoK. The Skardu airbase is about 100km from the Leh airbase on the Indian side,” the security official said.

“In the past, Pakistan had conducted joint air exercises with China at the Skardu airbase.”

A defence ministry official said that Chinese presence in PoK was not new.

“What we are witnessing now is that their military cooperation has deepened in recent months amid the border standoff in eastern Ladakh. Reports suggest that Pakistan has given China more foothold in the region,” he said.

A Chinese state-run company had in May this year signed a contract to build the Diamer-Bhasha Dam in Gilgit-Baltistan, PoK, despite Indian objections.

Also in the face of Indian opposition, Pakistan and China are building the \$60-billion China-Pakistan Economic Corridor that passes through PoK.

<https://www.telegraphindia.com/india/india-china-clash-pok-missile-sites-with-china-help-states-report/cid/1794130>

NATIONAL HERALD

Thu, 08 Oct 2020

ISRO plans to test ground landing of 'desi' space shuttle

The Indian Space Research Organisation (ISRO) is targeting to build RLV similar to USA's space shuttle to put into orbit satellites and come back to land for the next mission

The Indian space agency is likely to test its reusable launch vehicle's (RLV) landing on the ground sometime in November or December 2020, said a senior official.

The Indian Space Research Organisation (ISRO) is targeting to build RLV similar to USA's space shuttle to put into orbit satellites and come back to land for the next mission. This in turn would bring down the satellite launch costs.

The two Indian rockets in service - Polar Satellite Launch Vehicle (PSLV) and Geosynchronous Satellite Launch Vehicle (GSLV) - and also the upcoming Small Satellite Launch Vehicle (SSLV) - are expendable ones.

"We are planning to test the Reusable Launch Vehicle's landing in Chitradurga District in Karnataka. We want to do the test in November/December this year," S. Somanath, Director, Vikram Sarabhai Space Centre (VSSC) -- part of ISRO said.

As per plans, the RLV will be lifted up by a helicopter and from the height of four km it will be released.

Post release by the helicopter, the RLV will glide and navigate towards the runway and land on its own in an airfield in Chitradurga District deploying its parachute, Somanath said.

According to ISRO, RLV Interface System (RIS) for interfacing with helicopter and Qualification Model of landing gear have been realised.

Simply put, RLV will ascend to orbit, stay there, re-enter and land on a runway like an aircraft. The technology has the challenges of meeting the complexities of both -- a rocket and an aircraft.

According to Somanath, about 30-40 ISRO officials have to be taken to Chitradurga and stay there for about two weeks.

In 2016, ISRO successfully tested RLV's descent from an altitude of 65 km, its atmospheric re-entry at around Mach 5 (five times the speed of sound).

According to ISRO, the vehicle's navigation, guidance and control system accurately steered the vehicle during this phase for safe descent.

After successfully surviving high temperatures of re-entry with the help of its Thermal Protection System (TPS), the vehicle successfully glided down to the defined landing spot over Bay of Bengal, at a distance of about 450km from Sriharikota in Andhra Pradesh.

Total flight duration from launch to landing of this mission lasted for about 770 seconds.

<https://www.nationalheraldindia.com/national/isro-plans-to-test-ground-landing-of-desi-space-shuttle>



IANS Photo

Machine learning speeds up quantum chemistry calculations

By Emily Velasco

Quantum chemistry, the study of chemical properties and processes at the quantum scale, has opened many paths to research and discovery in modern chemistry. Without ever handling a beaker or a test tube, chemists can make predictions about the properties of a given atom or molecule and how it will undergo chemical reactions by studying its electronic structure—how its electrons are arranged in orbitals—and how those electrons interact with those of other compounds or atoms.

However, as powerful as quantum chemistry has shown itself to be, it also has a big drawback: Accurate calculations are resource-intensive and time consuming, with routine chemical studies involving computations that take days or longer.

Now, thanks to a new quantum [chemistry](#) tool that uses machine learning, quantum-chemistry calculations can be performed 1,000 times faster than previously possible, allowing accurate quantum chemistry research to be performed faster than ever before.

The tool, called OrbNet, was developed through a partnership between Caltech's Tom Miller, professor of chemistry, and Anima Anandkumar, Bren Professor of Computing and Mathematical Sciences.

"In quantum chemistry, there has been a punishing interplay between the accuracy of the calculation and the amount of time it takes," Miller says. "You would start a calculation, and would say, 'Well, see you on Tuesday.' But now, the calculations can be done interactively."

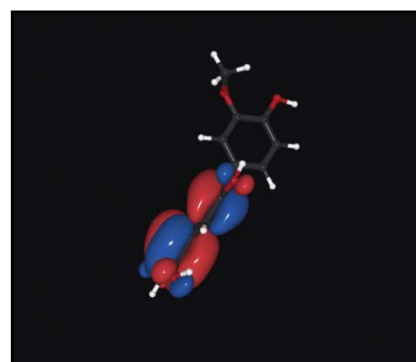
OrbNet uses a graph neural network, a type of machine-learning system that represents information as "nodes," which contain data, and "edges," which represent the ways those chunks of data are related to one another.

Miller says OrbNet works as well as it does because of an innovation in the way atoms and molecules are mapped to the graph neural network that is based around the Schrödinger equation, a piece of mathematics central to quantum mechanics.

"Previous graph architectures had organized the atoms as nodes and the bonds between the atoms as edges, but that's not the way quantum chemistry thinks about it," he says. "So, instead, we built a graph where the nodes are the electron orbitals, and the edges are interactions between the orbitals. That has a much more natural connection to the Schrödinger equation."

Like all machine-learning systems, OrbNet needs to be trained to perform an assigned task, similar to how a person who gets a new job needs to be trained for it. OrbNet learned to predict molecular properties on the basis of accurate reference quantum mechanical calculations. Anandkumar, whose research focuses on machine learning, helped design and optimize the graph neural network implementation.

"Orbnet is a great example of a deep-learning model that uses domain-specific features: in this case, molecular orbitals. This enables the machine-learning model to accurately do the calculations on molecules much larger, as much as 10 times larger, than the molecules present in training data," Anandkumar says. "For a standard deep-learning model, such extrapolation is impossible since it only learns to interpolate on the training data. Leveraging the domain knowledge of molecular orbitals was essential for us to achieve transferability to larger molecules."



OrbNet processes quantum-chemistry simulations much more quickly than previously possible, allowing real-time manipulation of molecules in the program. Credit: Entos Inc.

Currently, OrbNet has been trained on approximately 100,000 molecules, which Miller says allows it to perform many useful calculations for researchers, but ongoing efforts aim to scale it to larger training data sets.

"The prediction of molecular properties has many practical benefits. For example, OrbNet can be used to predict the structure of molecules, the way in which they will react, whether they are soluble in water, or how they will bind to a protein," he says.

Miller says future work on OrbNet will focus on expanding the range of tasks it can be used for through additional training.

"We have demonstrated it works for a small corner of organic chemistry, but there's nothing that prevents us from expanding the approach to other application domains," he says.

The paper describing OrbNet, titled, "OrbNet: Deep Learning for Quantum Chemistry Using Symmetry-Adapted Atomic-Orbital Features," was published in the *Journal of Chemical Physics* on September 25 and selected as an Editor's Pick.

More information: Zhuoran Qiao et al. OrbNet: Deep learning for quantum chemistry using symmetry-adapted atomic-orbital features, *The Journal of Chemical Physics* (2020). [DOI: 10.1063/5.0021955](https://doi.org/10.1063/5.0021955)

Journal information: [Journal of Chemical Physics](https://phys.org/news/2020-10-machine-quantum-chemistry.html)
<https://phys.org/news/2020-10-machine-quantum-chemistry.html>



Thu, 08 Oct 2020

Catalyst for sustainable gas synthesis

By Michael Keller

ETH researchers have developed a catalyst that converts CO₂ and methane efficiently into synthesis gas—a mixture of hydrogen and carbon monoxide. This could potentially help to produce sustainable fuels and plastics

Today, almost all fuels, combustibles and plastics are based on fossil carbon sources, such as oil, natural gas and coal. The search is underway worldwide for ways to replace fossil hydrocarbons with sustainable alternatives. One approach is the synthesis of organic compounds from the climate damaging raw materials methane (CH₄) and CO₂.

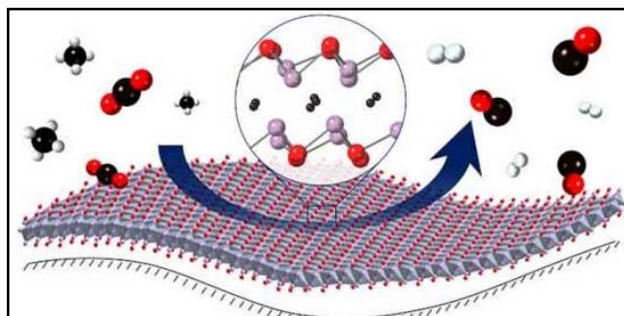
In an initial step, the two greenhouse gasses must react with each other through the input of energy. This results in a gaseous mixture of energy-rich hydrogen (H₂) and carbon monoxide (CO), known as synthesis gas.

A research team led by ETH professor Christoph Müller and senior scientist Alexey Fedorov has now developed an innovative catalyst that facilitates the conversion of CO₂ and CH₄ into synthesis gas much more efficiently than previous catalyst materials.

Synthesis gas is an important source material for the chemical industry. It can be further processed into synthetic liquid fuel or into methanol, which in turn serves as a base chemical in the manufacture of plastics.

Highly active and stable

The new catalyst consists of extremely thin metal oxycarbides—or more precisely the finest film of metal oxycarbides, just a few atomic layers thick, stabilized on an oxide support. The chemical reaction between CO₂ and methane to form synthesis gas takes place on these thin layers.



A thin film of metal oxycarbides on an oxide support facilitates the reaction between CO₂ and methane (CH₄) to produce hydrogen (H₂) and carbon monoxide (CO). Credit: Alexey Kurlov, Evgenia Deeva / ETH Zurich

These planar metal oxycarbides are around 1,000 times more active as a catalyst than their predecessors, metal carbides with a three-dimensional structure ("bulk" carbides). In addition, the new catalysts are extremely stable.

"Conventional catalysts based on metal carbides have the disadvantage that they oxidize in the presence of CO₂, and lose their activity as a result," explains Müller, Professor of Energy Science and Engineering in the Department of Mechanical and Process Engineering. The new metal oxycarbides do not have this disadvantage.

Closing the carbon cycle

The catalytic reaction between CO₂ and methane to produce synthesis gas is an important step towards the production of sustainable fuels and basic chemicals. Since CO₂ can be sourced from the atmosphere and only methane comes from fossil resources millions of years old, such synthetic fuels and chemicals can have a lower carbon footprint than fossil fuels.

There is still a long way to go, before the results apply at industrial scale. "We hope that our new catalyst will become an attractive option for the production of synthesis gas," says Fedorov, research associate in Müller's group and co-author of the study.

According to the researchers, the new reaction catalyst could be used in particular to replace expensive precious metal catalysts, such as those based on ruthenium. However, due to their catalytic properties, atomically thin films of metal oxycarbides also have the potential to open up a wide range of new applications.

More information: Alexey Kurlov et al. Exploiting two-dimensional morphology of molybdenum oxycarbide to enable efficient catalytic dry reforming of methane, *Nature Communications* (2020). [DOI: 10.1038/s41467-020-18721-0](https://doi.org/10.1038/s41467-020-18721-0)

Journal information: [Nature Communications](https://www.nature.com/articles/s41467-020-18721-0)

<https://phys.org/news/2020-10-catalyst-sustainable-gas-synthesis.html>



Thu, 08 Oct 2020

Quantum heat engine behaviour observed in a qubit

By Anna Demming

Although many of today's accepted theories of classical thermodynamics predate even the industrial revolution they helped to propel, many open questions remain around how these ideas translate to the level of single quantum systems. In particular, the potential for superposition of states has as yet unexplored implications for thermodynamic behavior. Now, a collaboration of researchers in Japan, the Ukraine and the U.S. has produced a quantum device that can not only behave analogously to a heat engine and a refrigerator, but also a superposition of both at the same time.

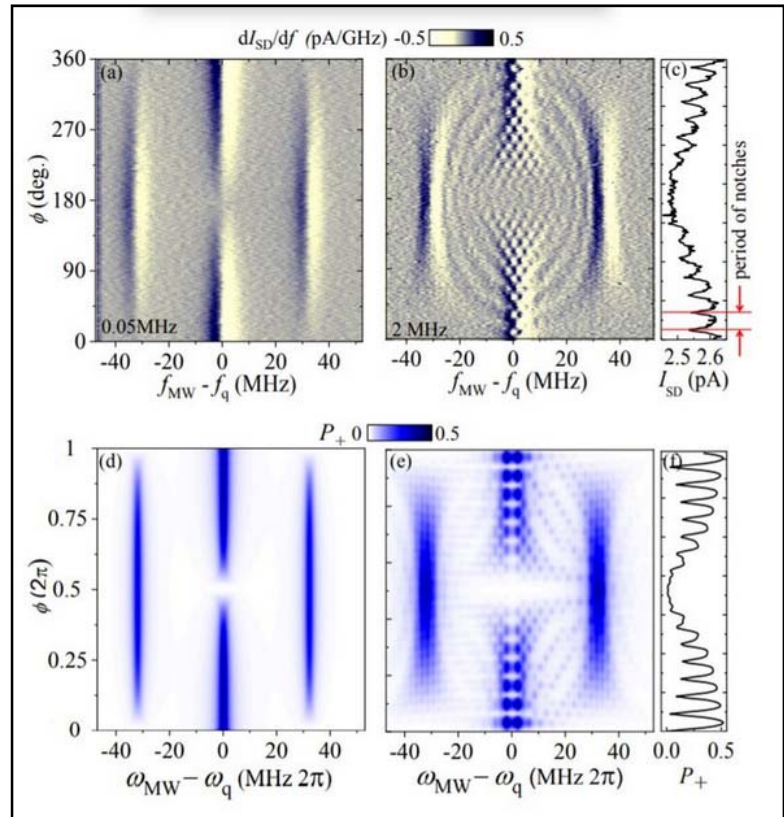
Keiji Ono, Sergey Shevchenko and Franco Nori—who share an affiliation with RIKEN in Japan, among their other institutions, B. Verkin Institute for Low Temperature Physics and Engineering and the University of Michigan—had all been working with qubits in various guises. They came together to examine the behavior of qubits based on impurities in silicon for quantum interferometry before turning their attention to how the behavior of these systems might resemble classical heat engines.

Experimental challenges

Exploring thermodynamics at the quantum level opens up some intriguing possibilities. "One of the subjects discussed in this field is the possibility of quantum heat engines to overcome the efficiency of classical ones," Shevchenko suggests as an example. However, it is not without its

challenges, which means most studies so far have been purely theoretical. Among other characteristics, for quantum engineering, it is important to have qubits which are "hot, dense, and coherent," Shevchenko tells Phys.org. Here, "hot" means working in the few-Kelvin regime, which, while still pretty frosty, is less technologically challenging than systems that require cooling down to millikelvins. The trade-off is that such hot systems are harder to describe and control, but here, the researchers were able to exploit their wealth of expertise with silicon-based qubits.

Ono, Shevchenko and Nori and their collaborators based their quantum thermodynamics studies on a tunneling field-effect transistor made from densely implanted impurities in silicon. Under source-gate voltages, transport across their device is dominated by tunneling between one impurity near the surface (shallow) and one nearby but deeper within the material, creating a two-energy-level device. The electron transport behavior of the device gives rise to interesting spin characteristics, in particular, an electron spin resonance in which the source-drain current peaks for specific applied AC and DC magnetic fields. From this resonance peak, they were able to extract two characteristic timescales that reflect the lifetime of the excited state on the impurity and its decoherence time. The decoherence time defines how long a definite phase relation is retained between its wavefunction and others, which allows superposition and interference.



Comparison of the measured peak currents (top) and the calculated excitation probabilities (bottom) showed a perfect match for the device in the incoherent regime (left) and coherent regime where the function becomes a superposition of heat engine and refrigerator operation (right). Credit: Physical Review Letters

As well as being able to drive the device with the gate voltage to populate the two energy levels, the researchers could also adjust the gap between the energy levels by modulating the frequency and amplitude of the magnetic fields. As a result, depending on whether the system was driven to the excited state when the gap was large and relaxed when it was smaller or the converse, it would operate analogously to an Otto heat engine or refrigerator. The interesting quantum effects occur when the relaxation period and the period of the driving voltage start to coincide. At this point, they show that the device function can be in a superposition of both an engine and a refrigerator state. Theoretical calculations of the excitation probability matched the measured peak currents perfectly.

Limits and future developments

There are some distinctions between the operation of their quantum device and a classical heat engine or refrigerator. In particular, there are no heat baths, although their device is connected to higher and lower voltage leads, acting as electric analogs of heat baths. Nonetheless, Shevchenko says, "It is surprising to consider the new possibility of having a quantum superposition of a tiny engine and a tiny refrigerator."

While the first to acknowledge that in the macroscopic or classical case, such a device would not service many practical demands, the researchers hope that for quantum objects it may introduce new functionalities that are not only interesting but also useful. As another example, Shevchenko

cites the laser, which was invented long before the now-ubiquitous applications became apparent. "We believe that our results are scientifically interesting," Shevchenko tells Phys.org. "For the time being, we are exploring its basic physics, and [believe] that the possible applications are not clear at this time. This often happens in science."

More information: K. Ono et al. Analog of a quantum heat engine using a single-spin qubit, *Physical Review Letters* (2020). Accepted manuscript: [journals.aps.org/prl/accepted/ ... b682605ce40bdae2719c](https://journals.aps.org/prl/accepted/.../b682605ce40bdae2719c)

Arxiv: arxiv.org/abs/2008.10181

Journal information: *Physical Review Letters*
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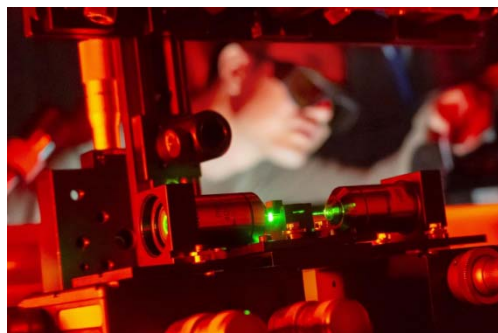


Thu, 08 Oct 2020

Intelligent nanomaterials for photonics

Since the Nobel Prize in Physics was awarded for research on graphene in 2010, 2-D materials—nanosheets with atomic thickness—have been a hot topic in science. This significant interest is due to their outstanding properties, which have enormous potential for a wide variety of applications. For instance, combined with optical fibers, 2-D materials can enable novel applications in the areas of sensors, non-linear optics, and quantum technologies.

However, combining these two components has so far been very laborious. Typically, the atomically thin layers had to be produced separately before being transferred by hand onto the optical fiber. Together with Australian colleagues, Jena researchers have now succeeded for the first time in growing 2-D materials directly on optical fibers. This approach significantly facilitates manufacturing of such hybrids. The results of the study were reported recently in the renowned journal on materials science *Advanced Materials*.



PhD student Quyet Ngo studies optical fibers functionalised by 2D materials. Credit: Jens Meyer/University of Jena

Growth through a technologically relevant procedure

"We integrated transition metal dichalcogenides—a 2-D material with excellent optical and photonic properties, which, for example, interacts strongly with light—into specially developed glass fibers," explains Dr. Falk Eilenberger of the University of Jena and the Fraunhofer Institute for Applied Optics and Precision Engineering (IOF) in Germany. "Unlike in the past, we did not apply the half-nanometre-thick sheet manually, but grew it directly on the fiber," says Eilenberger, a specialist in the field of nanophotonics. "This improvement means that the 2-D material can be integrated into the fiber more easily and on a large scale. We were also able to show that the light in the glass fiber strongly interacts with its coating." The step to a practical application for the intelligent nanomaterial thus created is no longer very far away.

The success has been achieved thanks to a growth process developed at the Institute of Physical Chemistry of the University of Jena, which overcomes previous hurdles. "By analyzing and controlling the growth parameters, we identified the conditions at which the 2-D material can directly grow in the fibers," says Jena 2-D materials expert Prof. Andrey Turchanin, explaining the method based on chemical vapor deposition (CVD) techniques. Among other things, a temperature of over 700 degrees Celsius is necessary for the 2-D material growth.

Hybrid material platform

Despite this high temperature, the optical fibers can be used for the direct CVD growth: "The pure quartz glass that serves as the substrate withstands the high temperatures extremely well. It is

heat-resistant up to 2,000 degrees Celsius," says Prof. Markus A. Schmidt of the Leibniz Institute of Photonic Technology, who developed the fibers. "Their small diameter and flexibility enable a variety of applications," adds Schmidt, who also holds an endowed professorship for fiber optics at the University of Jena.

The combination of 2-D material and glass fiber has thus created an intelligent material platform that combines the best of both worlds. "Due to the functionalisation of the glass fiber with the 2-D material, the interaction length between light and material has now been significantly increased," says Dr. Antony George, who is developing the manufacturing method for the novel 2-D materials together with Turchanin.

Sensors and non-linear light converters

The team envisages potential applications for the newly developed materials system in two particular areas. Firstly, the materials combination is very promising for sensor technology. It could be used, for example, to detect low concentrations of gasses. To this end, a green light sent through the fiber picks up information from the environment at the fiber areas functionalised with the 2-D material. As external influences change the fluorescent properties of the 2-D material, the light changes color and returns to a measuring device as red light. Since the fibers are very fine, sensors based on this technology might also be suitable for applications in biotechnology or medicine.

Secondly, such a system could also be used as a non-linear light converter. Due to its non-linear properties, the hybrid optical fiber can be employed to convert a monochromatic laser light into white light for spectroscopy applications in biology and chemistry. The Jena researchers also envisage applications in the areas of quantum electronics and quantum communication.

Exceptional interdisciplinary cooperation

The scientists involved in this development emphasize that the success of the project was primarily due to the exceptional interdisciplinary cooperation between various research institutes in Jena. Based on the Thuringian research group "2-D-Sens" and the Collaborative Research Centre "Nonlinear Optics down to Atomic Scales" of Friedrich Schiller University, experts from the Institute of Applied Physics and Institute of Physical Chemistry of the University of Jena; the University's Abbe Center of Photonics; the Fraunhofer Institute for Applied Optics and Precision Engineering IOF; and the Leibniz Institute of Photonic Technology are collaborating on this research, together with colleagues in Australia.

"We have brought diverse expertise to this project and we are delighted with the results achieved," says Eilenberger. "We are convinced that the technology we have developed will further strengthen the state of Thuringia as an industrial center with its focus on photonics and optoelectronics," adds Turchanin. A patent application for the interdisciplinary team's invention has recently been filed.

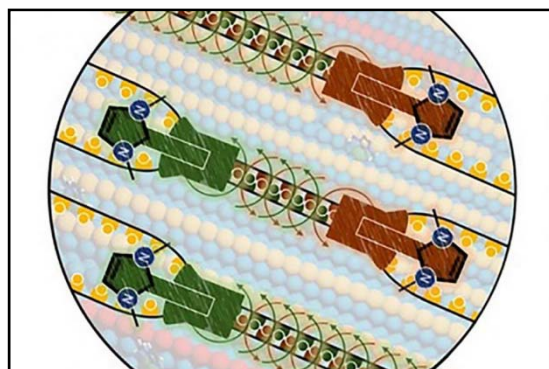
More information: Gia Quyet Ngo et al, Scalable Functionalization of Optical Fibers Using Atomically Thin Semiconductors, *Advanced Materials* (2020). DOI: [10.1002/adma.202003826](https://doi.org/10.1002/adma.202003826)

Journal information: [Advanced Materials](https://phys.org/news/2020-10-intelligent-nanomaterials-photonics.html)
<https://phys.org/news/2020-10-intelligent-nanomaterials-photonics.html>

Molecular swarm rearranges surface structures atom by atom

The surface of metals plays a key role in many technologically relevant areas, such as catalysis, sensor technology and battery research. For example, the large-scale production of many chemical compounds takes place on metal surfaces, whose atomic structure determines if and how molecules react with one another. At the same time, the surface structure of a metal influences its electronic properties. This is particularly important for the efficiency of electronic components in batteries. Researchers worldwide are therefore working intensively on developing new kinds of methods to tailor the structure of metal surfaces at the atomic level.

A team of researchers at the University of Münster, consisting of physicists and chemists and led by Dr. Saeed Amirjalayer, has now developed a molecular tool which makes it possible, at the atomic level, to change the structure of a metal surface. Using computer simulations, it was possible to predict that the restructuring of the surface by individual molecules—so-called N-heterocyclic carbenes—takes place similar to a zipper. During the process, at least two carbene molecules cooperate to rearrange the structure of the surface atom by atom. The researchers could experimentally confirm, as part of the study, this "zipper-type" mechanism in which the carbene molecules work together on the gold surface to join two rows of gold atoms into one row. The results of the work have been published in the journal *Angewandte Chemie International Edition*.



Much like a zipper, carbene molecules cooperate on a gold surface to join two rows of atoms into one row, resulting - step by step - in a new surface structure. Credit: Saeed Amirjalayer

In earlier studies the researchers from Münster had shown the high stability and mobility of carbene molecules at the gold surface. However, no specific change of the surface structure induced by the molecules could previously be demonstrated. In their latest study, the researchers proved for the first time that the structure of a gold surface is modified very precisely as a result of cooperation between the carbene molecules. "The carbene molecules behave like a molecular swarm—in other words, they work together as a group to change the long-range structure of the surface," Saeed Amirjalayer explains. "Based on the 'zipper' principle, the surface atoms are systematically rearranged, and, after this process, the molecules can be removed from the surface."

The new method makes it possible to develop new materials with specific chemical and physical properties—entirely without macroscopic tools. "In industrial applications often macroscopic tools, such presses or rollers, are used," Amirjalayer continues. "In biology, these tasks are undertaken by certain molecules. Our work shows a promising class of synthesized molecules which uses a similar approach to modify the surface." The team of researchers hopes that their method will be used in future to develop for examples new types of electrode or to optimize chemical reactions on surfaces.

More information: Saeed Amirjalayer et al, Cooperation of N-Heterocyclic Carbenes on a Gold Surface, *Angewandte Chemie International Edition* (2020). DOI: [10.1002/anie.202010634](https://doi.org/10.1002/anie.202010634)

Journal information: *Angewandte Chemie International Edition*
<https://phys.org/news/2020-10-molecular-swarm-rearranges-surface-atom.html>



Thu, 08 Oct 2020

Fighting pandemics with plasma

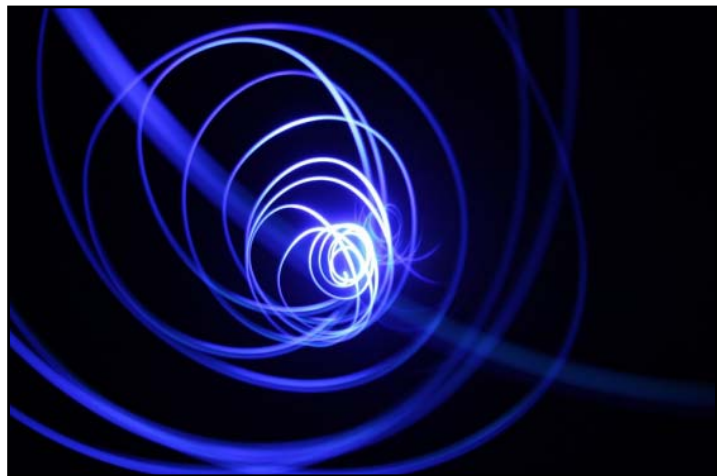
Most types of personal protective equipment, like N95 masks, gowns, and gloves, are designed for single use, which has led to both scarcity and waste during the COVID-19 pandemic. But new research suggests these vital supplies can be safely disinfected and reused.

Scientists have long known that ionized gases called plasma, which are made up of charged molecules, can kill pathogenic bacteria, viruses, and some fungi.

"What was not known was whether or not PPE would work afterward," said physicist David Staack. "Would an N95 still function after it was treated with plasma?"

Staack and his colleagues at Texas A&M University set out to answer that question by generating room-temperature plasma in a 20-foot-long shipping container.

"The idea would be to load up the PPE into this trailer, close the door, and run the cycle," said Staack. "Kind of like a dishwasher." At the end, an exhaust system filters out the reactive oxygen species produced in the process before people can enter and retrieve the equipment.



Credit: CC0 Public Domain

According to preliminary data presented this week at the American Physical Society's Gaseous Electronics Conference, a 90-minute cycle in the decontamination chamber can kill 99.9% of microbes, including coronaviruses similar to SARS-CoV-2. The researchers tested three different types of N95 masks and found that two of them remained usable, even after being subjected to a sterilization dose of the low-temperature plasma.

These promising results were recently verified by the Centers for Disease Control and Prevention, bolstering the research team's confidence that plasma can not only sterilize N95 masks but also keep them safe for reuse. Staack said they have shared the findings with the Food and Drug Administration for emergency use authorization, which would be required before the technology could be put to use at hospitals and other healthcare facilities.

Staack's group also detailed progress on sterilizing masks, gowns, and other types of PPE with various radiation doses from electron beams, which have long been used to kill microbes on medical devices. While the treatment effectively gets rid of germs, the experiments revealed that the high doses required for sterilization also degraded the masks and gowns—which means they couldn't be reworn.

Another group of researchers, led by Lorenzo Mangolini from the University of California, Riverside, presented an experimental, low-cost approach to sterilizing PPE. The scientists repurposed a plasma ball—the inexpensive toy that seems to produce lightning in a small glass sphere—to generate ozone, which is carried by a jet of compressed air through a facepiece respirator. In proof-of-concept experiments, this approach successfully killed pathogenic

Escherichia coli, which, because of its sturdy cell walls, may be more difficult to eradicate than viral particles like those of SARS-CoV-2.

"We've shown that sterilization can be done in a very cost-effective manner," said Mangolini. "For this to work, you just need a compressed air line and a high-voltage power supply from a toy."

Joseph Schwan, a graduate student in Mangolini's lab, estimated that the discarded, single-use PPE during the pandemic likely generates thousands of tons of waste per day. He noted that plasma-based approaches to sterilization and recycling could reduce that number.

More information: apsgec20.onlineeventpro.events/

Highlighted Abstracts

Electron Beam Irradiation of Personal Protective Equipment (PPE) Min Huang, Md Kamrul Hasan, Matt Pharr, David Staack & Suresh D. Pillai

POSTER 4:30 PM, Tuesday, October 6, 2020

Physical integrity analysis of Personal Protective Equipment (PPE) subjected to surface treatment by corona discharge generated Ozone

Md Abdullah Hil Baky, Min Huang, Shariful Islam Bhuiyan, Jamie Kraus, Howard Jemison & David Staack

LIVE 1:45 PM-2:00 PM, Wednesday, October 7, 2020 Development of an Ozone-based Treatment System for Reuse of Personal Protective Equipment (PPE) John Lassalle, Md Abdullah Hil Baky, Min Huang, Kavita Rathore, Matthew Burnette & David Staack

POSTER 4:30 PM, Wednesday, October 7, 2020

DBD produced ozone in forced convection as a facemask sterilizer Joseph Schwan, Troy Alva, Giorgio Nava, Carla Berrospe Rodriguez, Joshua Morgan, Justin Chartron & Lorenzo Mangolini LIVE 1:15 PM-1:30 PM, Thursday, October 8, 2020

<https://phys.org/news/2020-10-pandemics-plasma.html>



Thu, 08 Oct 2020

Research identifies new information to accelerate structure-based drug design against COVID-19

A new paper in *Nature Communications* outlines how an international research team has identified potential ways forward to rapidly design improved and more potent compounds in the fight against COVID-19. The work is the result of a massive fragment screening effort to develop an antiviral targeting the SARS-CoV-2 main protease. The project was led by Martin Walsh, Deputy Life Sciences Director at Diamond Light Source; Frank von Delft, Professor of Structural Chemical Biology at the University of Oxford and Principal Beamline Scientist of I04-1/XChem at Diamond; and Nir London, Assistant Professor at the Weizmann Institute Israel. The team combined mass spectrometry with the XChem facility at Diamond, the UK's national synchrotron, to rapidly identify new lead compounds for drug development to treat COVID-19.

For this study, called Crystallographic and electrophilic fragment screening of the SARS-CoV-2 main protease, the team probed an essential enzyme of SARS-CoV-2 with over 1,250 unique small compound, termed fragments, and identified 74 high-value fragment hits which can be used to develop new inhibitors for this essential viral protein. The paper details the data along with proposed design routes for progressing towards improved, more potent, compounds.

"COVID-19, caused by SARS-CoV-2, lacks effective therapeutics. Additionally, no antiviral drugs or vaccines were developed against the closely related coronavirus, SARS-CoV-1 or MERS-CoV, despite previous zoonotic outbreaks. To identify starting points for such therapeutics, we performed a large-scale screen of electrophile and non-covalent fragments through a combined mass spectrometry and X-ray approach against the SARS-CoV-2 main protease, one of two

cysteine viral proteases essential for viral replication. Our crystallographic screen identified 74 hits that span the entire active site, as well as three hits at the dimer interface. These structures reveal routes to rapidly develop more potent inhibitors and offer unprecedented structural and reactivity information for on-going structure-based drug design against SARS-CoV-2 main protease," explains Martin Walsh who in addition to his role at Diamond is also a Medical Research Council (MRC) funded Research Group Leader at the Research Complex at Harwell (RCaH).

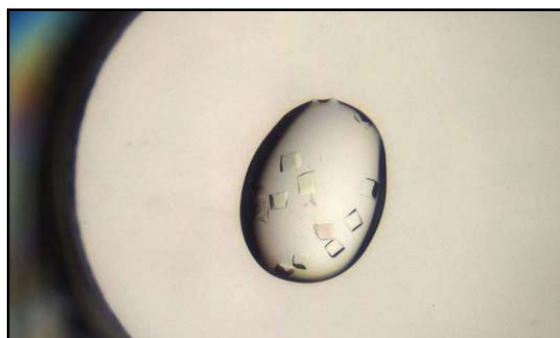
Structural biology, which can play a key role in drug development, was also rapidly deployed after the 2002 SARS-CoV-1 outbreak, with earlier work by the Hilgenfeld group on the main protease of coronaviruses leading to crystal structures of SARS-CoV-1 protease and inhibitor complexes. Other studies have taken the popular approach of a high-throughput screens (HTS) using very large compound libraries, followed by structural studies to elucidate the binding mode.

"Despite these efforts, drugs remain elusive that directly target SARS-CoV-2 (rather than disease symptoms) and are verified by clinical trials. In retrospect, this is perhaps unsurprising for the main protease inhibitors, as both peptidomimetic and covalent inhibition carry risks as strategies for drug development; in general, the simpler the molecule the lower the risk. We, therefore, applied a different approach to this protease, using fragment screening by high-throughput structural biology," adds Martin Walsh.

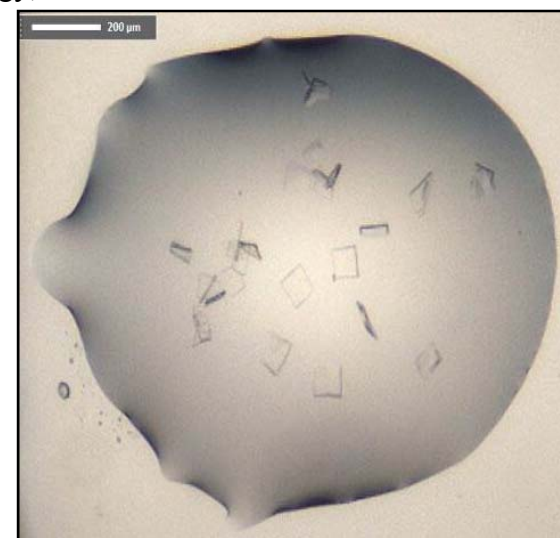
Fragment methods have become a staple of modern drug discovery, using small collections (100 s or 1000 s) of small compounds (<300 Da) that bind promiscuously and thus sample a far larger chemical space than is achieved by HTS. The challenge is that the very weak binding of fragment hits requires highly sensitive biophysical detection, careful confirmation of binding and specialised medicinal chemistry expertise take the hits and develop them into fully potent drug candidates. However, the real promise of fragments with the right expertise and equipment, they can quickly and efficiently be converted into valid drug candidates with a much simpler route to clinical impact.

Rapid advances in technology and automation at synchrotron radiation sources has made screening directly in crystal structures routinely possible at facilities like the XChem platform at Diamond Light Source. The team took the highly unusual route of releasing all the experimental data as soon as it was generated; the announcement on social media triggered a large international collaboration that harnessed the combined knowledge of scientists worldwide through a novel crowdsourcing initiative that they called COVID Moonshot.

"Performing the experiment and achieving the high data quality in a few weeks, as lockdown started, was a tour de force, and a credit to our highly talented scientists. Even more remarkable was the response of the international community to the data release: it mobilized a vast pool of expertise, technologies and philanthropy, which evolved into a unique and rigorous drug discovery effort that aims to develop rapidly an entirely novel, easily synthesized, oral antiviral with good safety and pre-clinical properties. Working fully in the open, data are released near real-time, so the outcome will be available to any drugs manufacturer world-wide. The world's focus has been



Structure of SARS-CoV-2 Main protease: (2) Crystals of CoVID-19 free enzyme - picture 1 of crystals picture shows image of Steve representation with all the fragments spattered on it. Credit: Diamond Light Source



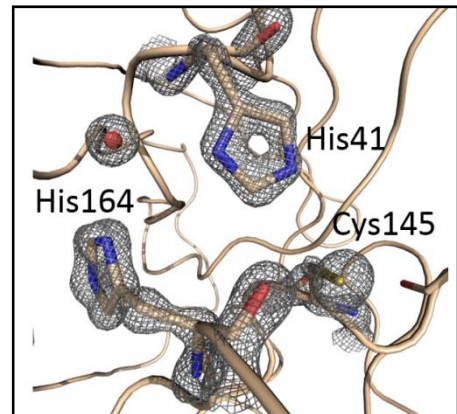
Structure of SARS-CoV-2 Main protease: (1) Crystals of CoVID-19 free enzyme - Steve representation with all the fragments spattered on it. Credit: Diamond Light Source

on vaccines and repurposing of existing drugs, but the Moonshot is one of a small number of projects attempting novel small molecule therapeutics," says Frank von Delft.

SARS-CoV-2 is a large enveloped, positive-sense, single stranded RNA Betacoronavirus. The viral RNA encodes two open reading frames that, through ribosome frame-shifting, generates two polyproteins ppla and pplab. These polyproteins produce most of the proteins of the replicase-transcriptase complex. The polyproteins are processed by two viral cysteine proteases: a Papain-like protease (PLpro) which cleaves three sites, releasing non-structural proteins nsp1-3 and a 3C-like protease, also referred to as the main protease (Mpro), that cleaves at 11 sites to release non-structural proteins (nsp4-16). These non-structural proteins form the replicase complex responsible for replication and transcription of the viral genome and have led to Mpro and PLPro being the primary targets for antiviral drug development.

More information: Alice Douangamath et al. Crystallographic and electrophilic fragment screening of the SARS-CoV-2 main protease, *Nature Communications* (2020). DOI: [10.1038/s41467-020-18709-w](https://doi.org/10.1038/s41467-020-18709-w)

Journal information: [Nature Communications](https://medicalxpress.com/news/2020-10-structure-based-drug-covid-.html)
<https://medicalxpress.com/news/2020-10-structure-based-drug-covid-.html>



Structure of SARS-CoV-2 Main protease: Representative electron density (2Fo-Fc map contoured at the 2.5 Å level) from the 1.39 Å structure centered at the active site of the enzyme. Credit: Diamond Light Source

THE ECONOMIC TIMES

Thu, 08 Oct 2020

Even mild Covid-19 infection can make people sick for months: Research

Synopsis

Two-thirds of patients who had a mild-to-moderate case of Covid-19 reported symptoms 60 days after falling ill, when more than a third still felt sick or in a worse condition than when their coronavirus infection began.

Covid-19 patients who experience even the mildest illness risk suffering symptoms for months, researchers in France found.

Two-thirds of patients who had a mild-to-moderate case of Covid-19 reported symptoms 60 days after falling ill, when more than a third still felt sick or in a worse condition than when their coronavirus infection began. Prolonged symptoms were more likely among patients aged 40 to 60 years and those who required hospitalization, according to staff at Tours University Hospital, who followed 150 non-critical patients from March to June.

Their study, published Monday in the journal *Clinical Microbiology and Infection*, adds to evidence that a proportion of the 35 million people known to have been infected with the SARS-CoV-2 virus worldwide will suffer lingering effects weeks to months later. Post-Covid clinics are opening in the pandemic's wake to cater for an expanding population of so-called long-haulers -- survivors left with scarred lungs, chronic heart damage, post-viral fatigue and other persistent, debilitating conditions.



Prolonged symptoms were more likely among patients aged 40 to 60 years and those who required hospitalization

“We were able to assess the evolution of the disease and demonstrate that even the mildest presentation was associated with medium-term symptoms requiring follow up,” Claudia Carvalho-Schneider and colleagues wrote. “Thus, the Covid-19 pandemic will involve a care burden long after its end.”

Two months after developing Covid-19 symptoms, 66% of adult patients reported suffering from at least one of 62 complaints, mainly a loss of smell and taste, shortness of breath, and fatigue, the researchers found. The study sought to identify the risk of longer symptom duration in patients with non-critical Covid-19, since much of the existing international research was based on survivors admitted to intensive care units, they said.

Longer-ranging studies and clinical trials will be critical to elucidate the durability and depth of health consequences attributable to Covid-19 and how these may compare with other serious illnesses, Carlos del Rio, executive associate dean at Emory University School of Medicine, and colleagues wrote in an editorial Monday in the Journal of the American Medical Association that reviewed the coronavirus’s persistent effects.

<https://economictimes.indiatimes.com/news/international/world-news/even-mild-covid-19-infection-can-make-people-sick-for-months-research/articleshow/78527862.cms>

