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CONTENT

DRDO News

DRDO Technology News

THE WIRE

Fri, 11 Sept 2020

Why is the Ministry of Defence so committed to forming committees?

At best, the ministry has cherry picked some recommendations for implementation, outrightly rejecting or remaining silent over the rest

By Amit Cowshish

The Ministry of Defence (MoD) appears to be a committee-happy colossus. Over several decades, it has instituted a mind-boggling number of panels, committees, working groups and task forces – often on matters previously examined by other, similar groups – only to later dump their reports and recommendations.

Defence Minister Rajnath Singh chairs a meeting with Chief of Defence Staff, Tri-Service Chiefs and senior officials of Ministry of Defence, in New Delhi, Thursday, April 30, 2020. Photo: PTI

At best, it has cherry picked some recommendations for implementation, outrightly rejecting or remaining silent over the rest. Consequently, most of these committees, barring a handful of exceptions, have had little or no impact, whether on indigenising defence requirements, hastening material procurement or improving the MoD's functioning.

On August 26, for instance, the MoD announced the institution of a five-member committee, headed by V. Ramagopal Rao, director of the Indian Institute of Technology in New Delhi, to overhaul the 52 laboratories of the government-run Defence Research and Development Organisation (DRDO) for 'current and future defence and battlefield needs'. This is a reiteration of a similar committee established in 2007 under Dr P. Rama Rao, former secretary, Department of Science and Technology, also to review the DRDO's functioning.

The Rao committee's recommendations, submitted in 2008, resulted in clubbing several DRDO laboratories and related institutions into smaller and more manageable clusters, but only after an internal MoD committee under the defence secretary had further scrutinised the recommendations and concurred in the regrouping of the DRDO's laboratories in seven technology clusters headed by distinguished scientists as their directors general. The need to review this arrangement yet again, which began functioning 2011-12 onwards, remains inexplicable.

There has, however, been no dearth of committees and task forces regarding self-reliance in India's defence requirements. In 1992-93 one such headed by the late A.P.J. Abdul Kalam, as DRDO head – and later president of India – had formulated a 10-year plan to augment the level of indigenisation in defence equipment from 30% to 70% by 2005. Almost two decades later, the situation remains unchanged, with India emerging as one of the world's largest materiel importers for successive years.

Subsequently, in 2004 the government constituted the Vijay Kelkar Committee, headed by the former finance secretary, to recommend changes in defence acquisition procedures by majorly involving the private sector. The report was submitted by it in two parts: the first in April 2005 that focused on defence procurement procedures in addition to recommending several ways to promote indigenous production.

Though some of the Kelkar committee recommendations, like the creation of a 15-year equipment acquisition plan and the introduction of offsets in defence purchases, were accepted, many others were shelved. The rejected ones included the vital recommendation for accreditation and fostering of *Raksha Udyog Ratnas*, or industrial 'jewels', in the private sector that could undertake major defence manufacturing projects and joint ventures.

The second part submitted later the same year suggested greater freedom for India's nine Defence Public Sector Undertakings (DPSUs) to form joint ventures and consortiums with overseas original equipment manufacturers to render them more efficient. Seven years later in 2012, MoD issued 'Guidelines for establishing Joint Venture Companies by DPSUs' which, some reports suggest, were rescinded in 2016.

The Kelkar committee also recommended corporatisation of the Ordnance Factory Board (OFB), which had been suggested by the T.K.A. Nair committee five years earlier in 2000. This was later to be recommended again by the Vice Admiral Raman Puri (retd) committee in 2015, albeit with slight changes, and the Lieutenant General D.B. Shekatkar (retd) committee the following year.

However, it was only on May 16, 2020 that finance minister Nirmala Sitharaman announced the decision to corporatise the OFB as a part of the wider defence reforms to improve its autonomy, accountability and efficiency. Not much is known about how and when can one expect this 'reform' to fructify.

Earlier, in 2001-02 following the recommendations of the L.K. Advani-led Group of Ministers, which examined the recommendations of the Kargil Review committee report on intelligence and operational lapses that led to an 11-week long border war with Pakistan in mid-1999, measures were initiated by the MoD to streamline military procurements. This included establishing the MoD's 'dedicated' Capital Acquisition Wing in 2001.

Since then, at least four committees have examined various aspects of the organisational structure and procedures evolved by the MoD for materiel procurements. The first was in 2007 under N.S. Sisodia, a retired civil servant and then director general of the New Delhi-based Institute of Defence Studies and Analyses, the IDSA. Its report was probably never made public.

In 2012, the National Security Council set up a task force under Ravindra Gupta, a former secretary to examine various aspects of defence modernisation and self-reliance. Four years later in 2016, a committee headed by Pritam Singh, a management professional, recommended setting up of a bespoke Defence Acquisition Organisation to, among other things, promote indigenisation and self-reliance and bring the entire gamut of procurement activities under one organisation.

The same year- 2016-the Committee of Experts, headed by Dhirendra Singh, another former secretary submitted a voluminous report which formed the basis for making several procedural changes to the Defence Procurement Procedure (DPP)-2016. Unsurprisingly, this too is presently under review by a committee set up last year under stewardship of the MoD's Director General (Acquisitions).

Meanwhile, the 2008 Defence Expenditure Review Committee under the stewardship of V.K. Misra, former secretary (defence finance) had made several recommendations to rationalise

defence expenditure, much like the Arun Singh Committee 25 years earlier chaired by a former minister.

What came out of the recommendations of these committees is unknown, but in 2016, yet another committee was constituted under General Shekatkar to re-balance defence expenditure by recommending measures to enhance the military's combat capabilities and to improve its "teeth to tail ratio", especially with regard to the Indian Army.

Of the 188 recommendations made by the Shekatkar committee on a wide array like defence budget, modernisation, structural reorganisation, and training, only a handful had been implemented till April 2020 that included the long-awaited appointment of a Chief of Defence Staff. With no deadline laid down for implementing the accepted proposals, it will not be surprising if MoD loses interest and constitutes one more committee to examine identical issues in the coming years.

All these innumerable committees and task forces have seldom proved fruitful, due principally to the change in political and bureaucratic leadership, or loss of interest, before the recommendations are implemented. Manohar Parrikar, the late defence minister, for example, was keen on creating a bespoke Defence Acquisition Organisation, but the 2016 Pritam Singh committee report which made innumerable suggestions to streamline this process was dumped once he returned to Goa as the chief minister.

Few past reports are available in the public domain, but the handful that are do not make any mention of the obstacles MoD may have to overcome while implementing its contentious recommendations. This, in turn, makes it difficult, if not impossible, for the MoD to take informed decisions. Often it also results in several MoD-associated organisations putting up stiff resistance to the recommended changes as they are perceived to be inimical to their particular intrinsic interests.

The recent recommendation to corporatise the OFB is a prime example of this impediment. For, while it is trendy to advocate its corporatisation, there is no attendant explanation on how executing this 'reform' will make the ordnance factories more efficient and serve the cause of self-reliance better. It also fails to address the concerns of the 80,000-odd OFB employees regarding their prospects at a time when unemployment is multiplying across pandemic-affected India.

In most instances these reports also do not contain ready-to-implement recommendations, necessitating time-consuming bureaucratic intervention to figure out ways on doing so. On closer examination, some of these proposals are found to be simply unimplementable, but in classic instance of bureaucratese the MoD's civil servants end up being blamed for implementation delays, or worse, for obstructing the recommendations.

A fundamental problem with many of the recommendations is their financial viability. Nothing illustrates this better than the suggestion of raising the country's annual defence outlay – excluding defence pensions – to 2.5 to 3% of the Gross Domestic Product. This proposal has been seldom backed by any explanation of why is this considered as an ideal level of funding to modernise the military; but more importantly, given the parlous state of the economy, how possibly could the defence outlay be raised to such astronomical levels.

In times of fiscal prudence it is time the MoD realised that disjointed, sporadic and repetitive efforts at reforms, based on nebulous ideas, divorced from financial realities, and without a dispassionate debate or multi-party political support, are unlikely to transform India's management of higher defence. There is a great opportunity waiting out there for MoD to disprove the maxim that committees are groups of people who individually can do nothing; but as a group they can decide that nothing can be done.

(Amit Cowshish is former financial advisor (acquisitions), Ministry of Defence
https://thewire.in/government/ministry-of-defence-committee-reports

FINANCIAL EXPRESS
Read to Lead

Fri, 11 Sept 2020

DRDO's Hypersonic Technology Demonstration Vehicle: Everything about India's latest defence technology

According to DRDO, the test saw the scramjet-powered HSTDV sustain a speed of Mach 6 during the course of its 22second flight at an altitude of 30 km

By Debjit Sarkar

India's Defence Research & Development Organization (DRDO) successfully test-fired the Hypersonic Technology Demonstration Vehicle (HSTDV) from the Abdul Kalam Island off the coast of Odisha earlier this week. While many more such tests will have to be carried out, this test has certainly laid the building blocks for a credible development of future scramjet-powered hypersonic delivery system. According to DRDO, the test saw the scramjet-powered HSTDV sustain a speed of Mach 6 during the course of its 22second flight at an altitude of 30 km. Basically this means in 22 seconds the HSTD covered at least 40 kms.

Need for Speed

A missile powered by a solid rocket motor missile is like a gun. If you fire the gun from the ground you will get a certain distance for range. But take the same gun up 20,000 m and fire it and the same round will launch the projectile to much higher speed because of less drag and the projectile will travel much further. The HSTDV will comprise of a solid rocket component to get it into the air and flying and subsequently it will utilize its scramjet engine to rise and accelerate to a high elevation where its jet engine functions most proficiently. Being flown up to a high altitude at a realistic speed implies that its preliminary rocket motor boost will take it higher and faster so the scramjet motor can be employed less, thereby cutting back on fuel consumption. The hypersonic vehicle could steadily increase speed as it loses fuel weight exhausting the fuel more efficiently and increasing the range a bit.

The HSTDV will comprise of a solid rocket component to get it into the air and flying and subsequently it will utilize its scramjet engine to rise and accelerate to a high elevation where its jet engine functions most proficiently. (Photo source: Video screengrab)

The best protection that hypersonic cruise missiles have against Electronic Warfare is very high speed. This is because the homing systems onboard each missile can acquire the target position from a distance where the jamming density is still low and the missile can proceed up to a precomputed impact point, and thereafter can execute random high-G manoeuvres, without any more correction being provided from the homing system. Both the Indian Navy and the Indian Air Force will find such a hypersonic missile to be very valuable. This is because of a hypersonic attack can take place with very little forewarning. This dynamic and the randomness of the targets of a hypersonic attack reduces the timeline for a counter strike by the party being attacked. Hypersonic missiles also amplify the probability of a disarming attack.

Advantages of a Scramjet

Scramjets can be used to power, not just cruise missiles but also aircraft. A scramjet contains a tube of a design that lets the fuel to burn at supersonic speeds. Ergo, complicated air intake is not needed and the only constraint on speed is the heat capacity of the aircraft and the engines. Maximum speed for a scramjet is orbital speed or greater. Because of its shape, an aircraft can be equipped with scramjets, the intakes can be closed during take-off and it will inject fuel and oxygen into the chambers to gather speed down the runway on rocket propulsion. When moving forward, the oxygen could be cut off and the intakes opened to use air for the oxygen and lift-off

could be attained by means of scramjet propulsion all the way up to space where the intakes can be closed again and thereafter, rocket mode can be used.

Counter to Counter Stealth

A number of countries including India's adversaries like China are working on ways to counter stealth. Eventually, HSTD could well pave the way for the development of a counter to counter stealth aircraft. Low Observable in radio frequency bands combinedwith intensespeed will help to deteriorate the reaction time of a radar-guided surface to air missile. The massive infra-red signature will noticeably preclude the aircraft from truly being stealthy but the combination of speed, low observable radio frequency and altitude can make a difference if done appropriately. Shape and speed are directly related if an aircraft intends to fly at very low speed, then a biplane layout is pretty good. High subsonic speed necessitates a swept wing. Hypersonic speed works well in an aircraft that has a small wing and a lifting body shape. The dividing line between what is now described as a precision-guided munition and an unmanned vehicle will gradually blur. Aircraft dispensing such weapons will progressively become multipurpose battlefield aircraft, capable of being used for numerous long-range power projection assignments.

Road Forward

India also has a robust intercontinental ballistic missile (ICBM) program. ICBMs have excellent range and speed but new Anti-Ballistic Missile systems like the S-500 are being designed to shoot them down. Consequently, new warheads for ICBMs that can manoeuvre are being developed. However, the technology to manoeuvre within the atmosphere at those speeds necessitates new heat resistant materials and propulsion systems. Presumably, DRDO will take those materials and systems and apply them to their hypersonic cruise missiles thereby make them more effective and able to penetrate existing air defences. Similarly, India will also have to prepare to intercept hostile hypersonic missiles. Hypersonic threats compel the threatened states to take such actions as decentralization of command and control of strategic forces, extensive scattering of such forces, a launch-on-warning stance, or a strategy of pre-emption during an exigency. And to that end developing Directed Energy Weapons (DEW) especially solid-state laser is important. But that's another tale for another time.

(The author is a subject matter expert on competitive intelligence and market research in the defence and aerospace and industry. Views expressed are personal.)

https://www.financialexpress.com/defence/drdos-hypersonic-technology-demonstration-vehicle-everything-about-indias-latest-defence-technology/2079566/

THE ECONOMIC TIMES
WWW.ECONOMICTIMES.COM

Fri, 11 Sept 2020

Hardeep Singh Puri to review ongoing development work at Darbhanga, Deoghar airports on Saturday

Synopsis

Civil Aviation Minister Hardeep Singh Puri will visit the airports at Darbhanga and Deoghar on Saturday to review the ongoing development work, according to an official statement.

Civil Aviation Minister Hardeep Singh Puri will visit the airports at Darbhanga and Deoghar on Saturday to review the ongoing development work, according to an official statement. "The Airports Authority of India (AAI) is developing these airports. With the operationalisation of these airports, air connectivity of the region will be improved," the statement by the Civil Aviation Ministry said on Thursday.

The AAI is developing the civil enclave at Darbhanga airport in Bihar for commencement of passenger flight operations with Delhi, Mumbai and Bengaluru under regional connectivity scheme 'Udan', the ministry noted. Construction of Darbhanga airport's interim terminal building, which has an area of 1400 square metre, is complete, it said.

The Deoghar airport in Jharkhand is being developed by the AAI in collaboration with the Defence Research and Development Organisation (DRDO) and the state government. "The development of (Deoghar) airport with a project cost of Rs 401.34 crore is underway and will be completed very soon," the ministry noted.

https://economictimes.indiatimes.com/industry/transportation/airlines-/-aviation/hardeep-singh-puri-to-review-ongoing-development-work-at-darbhanga-deoghar-airports-on-saturday/articleshow/78040139.cms

Defence News

Defence Strategic: National/International

THE HINDU

Fri, 11 Sept 2020

Rafale induction a game changer, says Rajnath Singh

This also marks their operational induction, Air Chief

By Dinakar Peri

Ambala: Defence Minister Rajnath Singh on Thursday called the induction of the French Rafale fighter jet into the Indian Air Force (IAF) a "game changer" and termed it a very important step in the light of the prevailing security conditions that "have been created along India's borders."

This formal ceremony also marks their full operational induction into the IAF, said Air Chief Marshal (ACM) RKS Bhadauria. "They are good to go and deliver," he said.

At the ceremony at the Ambala airbase, Mr. Singh said, "The IAF plays an important role in maintaining military deterrence and their actions will be decisive in any future war. While the prevailing situation on our boundaries has caught our attention, we should not ignore the threat of cross-border terrorism".

Rafale fighter aircraft which was inducted into indian airforce at the Ambala air base on September 10, 2020. | Photo Credit: R.V. Moorthy

India's responsibilities were not limited to land borders alone. In the Indo-Pacific and the Indian Ocean region, it was working with international community as a commitment to world peace, he noted.

Vigilance was the first measure of security on the northern borders amid current security challenges, he pointed out.

French Defence Minister Florence Parly who was present at the induction, said that in strategic terms, India would have an edge over the entire region with the induction of the Rafales.

Five Rafales were inducted into the No. 17 Golden Arrows squadron. This is the first imported fighter to be inducted since the Sukhoi-30s came from Russia in the late 90s.

More opportune time

Air Chief Marshal Bhadauria, in a reference to the ongoing stand-off with China along the disputed boundary in Ladakh, said the induction could not have happened at a more opportune time, given the security scenario today.

Pilots had undergone intense combat training with other aircraft and also firing of advanced weaponry. From Ambala, the Rafales would be able to rapidly access our areas of interest, he added.

A traditional 'Sarva Dharma Puja' was performed, followed by an air display by the Rafales and indigenous Tejas aircraft as well as by the Sarang helicopter aerobatic team. A traditional water cannon salute was given to the jets before their formal induction.

The five Rafales arrived at Ambala from France in July-end. They were handed over to India in France last October but have since been used for training IAF pilots there.

The jets, three single-seat and two twin-seater trainers, were flown from France by IAF pilots led by Commanding Officer of No. 17 squadron Group Captain Harkirat Singh. They give a major capability boost to the IAF amid falling squadron strength. Upon India's request, France has speeded up deliveries of the Meteor Beyond Visual Range (BVR) air-to-air missile along with the first batch of jets. The second batch of four Rafales are expected to arrive in October.

'France always with India'

In a joint statement after the bilateral talks between the two sides, Ms. Parly said the induction of the Rafale marked a step forward in the strategic partnership that dated back to 1998. "France has always stood beside with India both through good and bad times," she noted.

Ms. Parly stated that they also planned to reinforce cooperation in maritime, air, space and cyber domains. There were also great prospects for cooperation in the Indo-Pacific, where "there are common ambition in terms of maritime security and preservation of freedom of navigation."

2016 agreement

In September 2016, India signed a €7.87 billion Inter-Governmental Agreement (IGA) with France for 36 Rafales in fly-away condition with 13 India Specific Enhancements (ISE). The Rafale was originally selected under the Medium Multi-Role Combat Aircraft (MMRCA) tender issued in 2007. But the final deal got stuck due to differences and the tender was eventually withdrawn after the emergency purchase announcement by Prime Minister Narendra Modi in April 2015, citing "critical operational necessity" of the IAF.

The ISE include Israeli helmet-mounted displays, radar warning receivers, low-band jammers, infra-red search and tracking systems among others. In addition, the Rafale is armed with the Meteor missile (considered a game changer in the region with a range of over 150 km), the SCALP long-range stand-off attack air-to-ground missile and the MICA multi-mission air-to-air missile. The IAF is also arming the Rafale with HAMMER (Highly Agile Modular Munition Extended Range) medium-range air-to-ground missiles being procured through emergency route.

The Ambala airbase also houses two squadrons of Jaguar fighters and one squadron of MiG-21 Bison. Hasimara in West Bengal will house the second Rafale squadron.

https://www.thehindu.com/news/national/iaf-inducts-five-rafale-jets-at-ambala/article32568597.ece

THE ECONOMIC TIMES
WWW.ECONOMICTIMES.COM

Fri, 11 Sept 2020

Indian Army occupies heights overlooking PLA Army positions at Finger 4 along Pangong Tso

Synopsis

"Indian Army has occupied heights overlooking the Chinese Army positions at Finger 4 along the Pangong Tso. These operations were carried out along with the pre-emptive actions to occupy heights near the Southern bank of Pangong Tso around August-end," a source told ANI.

New Delhi: Indian Army has occupied heights overlooking the Chinese Army positions at Finger 4 along Pangong lake.

Indian troops establish dominance at Pangong Tso's Finger 4, take control of several heights

The operations to occupy the heights were carried out along with the pre-emptive actions to occupy heights near the Southern bank of Pangong Tso around August-end, sources said on Thursday.

"Indian Army has occupied heights overlooking the Chinese Army positions at Finger 4 along the Pangong Tso. These operations were carried out along with the pre-emptive actions to occupy heights near the Southern bank of Pangong Tso around August-end," a source told ANI.

Sources said the Chinese Army had occupied the heights near the Finger 4 but the Indian Army has now occupied the heights which overlook the Chinese positions at heights including the Green top.

The Chinese have been sitting at Finger 4 from around April-May timeframe but have refused to disengage from there and other friction points in eastern Ladakh sector.

In another development, armies of India and China held interactions at Brigade Commander-level and Commanding Officer-level in eastern Ladakh on Thursday which are aimed at keeping the communication lines open between the two sides.

"Armies of India and China today held interactions at Brigade Commander-level and Commanding Officer-level in Eastern Ladakh. Interactions are aimed at keeping the communication lines open between the two sides," Indian Army sources said.

India recently outflanked China by taking control of strategic height near Pangong lake's southern bank. It thwarted an attempt by the Chinese army to transgress into Indian areas near the southern bank of Pangong Tso near Chushul in Ladakh.

India and China have been engaged in a standoff since April-May over the transgressions by the Chinese Army in multiple areas including the Finger area, Galwan Valley, Hot springs, and Kongrung Nala. The situation worsened after 20 Indian soldiers were killed in violent clashes with Chinese troops in Galwan valley in June.

https://economictimes.indiatimes.com/news/defence/indian-army-occupies-heights-overlooking-chinese-army-positions-at-finger-4-along-pangong-tso/articleshow/78042310.cms

अमर उजाला

Fri, 11 Sept 2020

भारतीय सेना ने फिंगर 4 के पास की चोटियों पर किया कब्जा, चीन पर सीधी नजर

नई दिल्ली: भारत-चीन के बीच वास्तविक नियंत्रण रेखा पर तनाव अभी बरकरार है। हालांकि भारतीय सेना यहां लगातार खुद को मजबूत करने में लगी हुई है और चीनियों की घुसपैठ का मुंहतोड़ जवाब दे रही है। फिलहाल सूत्रों के मुताबिक भारतीय सेना ने पैंगोंग त्सो झील के किनारे फिंगर 4 पर ऊंचाई वाली जगह को अपने कब्जे में लेकर चीन के सामने अपनी स्थिति को मजबूत कर लिया है।

Indian army - फोटो: amar ujala

सूत्रों के मुताबिक, पैंगोंग त्सो झील के दक्षिणी छोर पर मौजूद ऊंचाई वालीं जगहों पर कब्जा करने के लिए भारतीय सेना ने अगस्त के आखिरी में ही चढ़ाई शुरू कर दी थी। इसी के तहत भारतीय सेना ने चीन की स्थिति को देखते हुए ऊंचाई वाली कई महत्वपूर्ण जगहों पर वापस से कब्जा कर लिया है।

सूत्रों ने बताया कि पहले चीनी सेना का फिंगर 4 के पास ऊंचाई वाली जगहों पर कब्जा था, लेकिन अब एक बार फिर से भारतीय सेना ने उन जगहों पर कब्जा कर लिया है, जिसके बाद अब चीन के आगे भारतीय सेना की स्थिति बहुत मजबूत हो गई है।

चीनी अप्रैल-मई के आसपास फिंगर 4 पर बैठ गए थे और फिर इसे अपना बताते हुए भपीछे हटने से इंकार कर दिया था। हालांकि फिलहाल भारतीय सैनिकों ने एक बार फिर से रणनीतिक महत्व वाली कई ऊँची जगहों पर कब्ज़ा कर के अपनी स्थिति को मजबूत कर लिया है।

उधर भारत द्वारा लगातार अहम जगहों को अपने कब्जे में लेने के बाद से चीनी घुसपैठ करने की कोशिश में लगे हुए हैं। चीनी सैनिकों ने 29-30 अगस्त की रात पैंगोंग झील के दक्षिणी छोर की पहाड़ी पर कब्जे की कोशिश की थी, लेकिन भारतीय जवानों ने उसे नाकाम कर दिया। इसके बाद चीन ने 1 सितंबर और सात सितंबर को भी घुसपैठ करने की कोशिश की, लेकिन सतर्क भारतीय सैनिकों द्वारा खदेड़ दिए गए।

वहीं भारतीय सेना के सूत्रों ने बताया कि भारत और चीन की सेनाओं ने आज पूर्वी लद्दाख में ब्रिगेड कमांडर-स्तर और कमांडिंग ऑफिसर स्तर पर बातचीत की। बातचीत का उद्देश्य दोनों पक्षों के बीच संचार माध्यम को बरकरार रखना रहा।

भारत-चीन में ब्रिगेड कमांडर और कमांडिंग ऑफिसर स्तर की बातचीत

पूर्वी लद्दाख में बृहस्पतिवार को भारत और चीन के बीच तनाव कम करने के लिए ब्रिगेड कमांडर और कमांडिंग ऑफिसर स्तर की बातचीत हुई। इस बातचीत में मुख्य जोर दोनों देशों के बीच संपर्कों को बहाल करना था। भारतीय सेना के सूत्रों के मुताबिक, दोनों देशों ने एक-दूसरे के बीच संपर्क लाइन खोलने के मुद्दे पर बातचीत की।

सैन्य और कूटनीति चैनल के जरिये लगातार संपर्क में दोनों देश: विदेश मंत्रालय

विदेश मंत्रालय के प्रवक्ता अनुराग श्रीवास्तव ने कहा कि भारत सीमा विवाद मामले को शांतिपूर्ण तरीके से सुलझाने के लिए प्रतिबद्ध है। विवाद हल करने के लिए भारत व चीन सैन्य और कूटनीतिक चैनलों के जरिये लगातार संपर्क में हैं। यह सहमति दोनों देशों के रक्षामंत्रियों की मुलाकात में बनी थी।

https://www.amarujala.com/india-news/indian-army-reached-high-position-on-finger-four-in-pangong-tso-strengthened-against-china

अमर उजाला

Fri, 11 Sept 2020

लिपुलेख में सेना ने शुरू किया मोर्चों को सुधारने का काम, भारतीय सुरक्षा एजेंसियां भी अलर्ट

सार

चीनी सैनिकों की हरकतों को देखते हुए भारतीय सुरक्षा एजेंसियां भी अलर्ट

विस्तार

नई दिल्ली: भारतीय सीमा पर चीनी सेना के जमावड़े और सैनिकों की हरकतों को देखते हुए भारतीय सुरक्षा एजेंसियां अलर्ट हो गई हैं। लिपुलेख में सेना ने नाभीढांग से लिपुलेख के बीच में स्थित पुराने मोर्चों को सुधारने का काम शुरू कर दिया है।

सीमा पर सुरक्षा एजेंसियां चौबीसों घंटे गश्त कर रही हैं। रात में नाइट विजन कैमरों से सीमा की निगरानी की जा रही है। सुरक्षा एजेंसियों की ओर से सीमा पर होने वाली हर गतिविधि की जानकारी प्रतिदिन केंद्र को भेजी जा रही है।

चीन सीमा पर गश्त करते जवान - फोटो: फाइल फोटो

लद्दाख में जिस तरह से चीनी सेना बार-बार घुसपैठ की कोशिश कर रही है उसको देखते हुए लिपुलेख में भी भारतीय सुरक्षा एजेंसियां खासी सतर्क हैं।

धारचूला से लेकर कालापानी तक भी निगरानी कर रहे जवान

जहां नेपाल सीमा पर धारचूला से लेकर कालापानी तक सशस्त्र सीमा बल के जवान निगरानी कर रहे हैं, वहीं चीन सीमा पर कालापानी से लेकर लिपुलेख तक और मिलम में सेना और अर्द्धसैनिक बल भारत-तिब्बत सीमा पुलिस के जवान मुस्तैदी के साथ डटे हैं।

जब से सीमा पार चीनी सैनिकों के जमावड़े और मिसाइल बेस बनाने की खबरें आईं हैं, भारतीय सुरक्षा एजेंसियों ने भी सुरक्षा के इंतजाम कड़े करने शुरू कर दिए हैं। सूत्रों के अनुसार चीन सीमा में पहले से बने मोर्चे को सेना सुधार रही है। हर परिस्थिति का मुकाबला करने के लिए नाभीढांग से लेकर लिपुलेख तक सभी मोर्चों का सुधार किया जाएगा।

https://www.amarujala.com/dehradun/india-china-border-clash-latest-news-indian-army-force-on-alert-in-lipulekh?pageId=1

The Indian EXPRESS

Fri, 11 Sept 2020

Explained: The evolving role of religious teachers in Army

A multi-faith prayer was held during the induction ceremony of Rafale jets in the IAF at Ambala Air Force Base

By Sushant Kulkarni

Pune: As Rafale jets joined the Indian Air Force at Ambala Air Force Base, a *sarva dharma prarthana* or a multi-faith prayer was held during their induction ceremony. The prayer performed by the religious teachers is a unique feature of many important ceremonies of the India's armed forces, particularly the Army.

A look at the concept of religious teachers in the Indian Army, their training at Institute of National Integration and their evolving role as counsellors for the troops.

Ambala: Priests perform 'Sarva Dharma Puja' during the Rafale induction ceremony, at IAF airbase in Ambala, (PTI Photo/Manvender Vashist)

Religious teachers of the Indian Army

Armed forces across the world have had the tradition of priests or clerics who accompany the troops. In India, the tradition of having military chaplains who were ministers accompanying the troops in the British era was carried forward even after the independence. Initially, religious teachers from various faiths were recruited by individual units of the Army but, over the years, the process was institutionalised.

The Institute of National Integration (INI) of the Army was established in Pune in 1984 where training of religious teachers for the Army is conducted. The Recruit Religious Teachers for the Army are selected through a separate process, undergo training at the INI, and are commissioned as Junior Commissioned Officers (JCOs) with designations like Pundits, Maulavis, Priests, Monks or Granthis.

These RTs upon their commission into the Army get posted with the Army units spread across the country. At the INI, the recruits get trained in tenets of Hinduism, Islam, Christianity, Buddhism and Sikhism. The recruits are not just trained in their own religion but also receive lessons about others, thus making the training multi-faith in nature.

The *sarva dharma sthal* and multi-faith prayers at ceremonies

A very unique feature of almost all the Army units in India, where troops are stationed or trained, is a place called the *sarva dharma sthal*, which is a place of worship for all religions and faiths. The religious teachers posted are with the Army units as per the composition of individual units and are in-charge of these *sarva dharma sthal*. Along with being a place where everyone can worship, these *sarva dharma sthal* are also a symbol of harmony.

All the major ceremonies held at the Army establishments, where troops are trained or stationed, consist of the multi-faith prayer like the one held at Ambala. At the ceremonies, where 'Presidential Colours' are presented to the Armed Forces units, a multi-faith prayer is always held. In such ceremonies, the religious teachers recite verses from the religious texts and pray for the troops.

While some important ceremonies of the Navy and Air Force have also had multi-faith prayer in the past, the Naval and Air Force establishments do not commonly have the concept of *sarva dharma sthal* in their units.

The evolving role of religious teachers as counsellors

Over the past few years, the religious teachers are being trained in behavioural and social sciences. One of the important issues the soldiers face is the combat stress and the religious teachers are being trained to do group counselling of the troops through lectures, sermons and interactions. If they come across individual soldiers who could use professional help to deal with psychological issues, they can be referred to authorities concerned.

In conflict scenarios, soldiers have to stay away from their homes and families. Religious gatherings where soldiers come together often have motivating talks by the religious teachers which may help in keeping morale high.

A religious teacher from the Army said, "The idea of an all-faith place of worship is arguably only in the Indian Army among the forces across the world. A true symbol of harmony. For example, the death of a soldier is always tragic but the troops have to face it. The religious teachers are also trained in performing these rituals. In cases, when a religious teacher of one particular faith is not available in one particular unit, the teacher of another faith performs those rituals. This only happens in the Indian Army. All the teachers are given brief training of basic practices, notions and rituals in all the religions to which the soldiers belong."

https://indianexpress.com/article/explained/induction-ceremony-of-rafale-jets-multi-faith-prayer-army-6591041/

DH DECCAN HERALD

Fri, 11 Sept 2020

India opens its army, navy and air bases for Japan; adds military heft to Quad amid stand-off with China

By Anirban Bhaumik

India and Japan have opened up their military bases for each other's army, navy and air force – elevating bilateral defence cooperation amid China's growing belligerence.

With New Delhi and Tokyo signing the Acquisition and Cross-Servicing Agreement (ACSA), India now has military logistics sharing agreement with all its partners – the United States, Australia and Japan – in the 'Quad', a four-nation coalition re-launched in November 2017 to build a bulwark against China's expansionist moves in the Indo-Pacific region.

The India-Japan Acquisition and Cross-Servicing Agreement (ACSA) was signed in New Delhi shortly before the Prime Ministers of the two nations – Narendra Modi and Shinzo Abe – spoke with each other over the phone. They concurred that the agreement would "further enhance the depth of defence cooperation between the two countries and contribute to peace and security in the Indo-Pacific region", according to a press release issued by the Ministry of External Affairs in New Delhi.

Modi and Abe were expected to hold a virtual summit on Thursday but since Abe recently announced his resignation from the office of the Prime Minister of Japan, a full-fledged summit was not held.

The new pact will set up a framework for the militaries of India and Japan to share logistics and help each other by providing food, water, billeting, transport, petroleum, oils, lubricants, clothing and communications as well as medical services to each other's personnel. It also allows sharing of military bases, storage and other facilities, training services, spare parts and components as well as providing repair and maintenance services at the airports and seaports to each other.

New Delhi signed the military logistics sharing agreement with Tokyo amid China's growing belligerence, not only along its disputed boundary with India, but also elsewhere in Indo-Pacific, including in the contested waters of the South China Sea and the East China Sea as well as in Taiwan Strait.

The Logistics Exchange Memorandum of Agreement (LEMOA) between India and the United States was signed in August 2016. India and Australia signed a similar Mutual Logistics Support Agreement (MLSA) on June 4 this year – just about a month after the stand-o between the Indian Army and the Chinese People's Liberation Army (PLA) started in eastern Ladakh.

China's aggressive moves to alter the status quo along its disputed boundary with India prompted New Delhi to focus on adding military heft to the 'Quad'. The warships of the Indian Navy and Japanese Maritime Self-Defence Force had an exercise in the Indian Ocean on June 27. The Indian Navy's warships on July 20 also participated in a drill with the USS Nimitz Carrier Strike Group, which was on its way to West Asia after conducting a drill with USS Ronald Reagan in the South China Sea.

The navies of India, Japan and the US are likely to hold the Malabar 2020 exercise later this year near the Malacca Strait in the Indian Ocean in order to send out the message to China that the sea lane, which is vital for the communist country, could be choked in case of a conflict in the region. The annual trilateral drill may even be elevated to the first-ever naval exercise of the Quad with the participation of the Australian Navy – a move, which could raise China's hackles.

https://www.deccanherald.com/national/india-opens-its-army-navy-and-air-bases-for-japan-adds-military-heft-to-quad-amid-stand-off-with-china-885480.html

THE ECONOMIC TIMES
WWW.ECONOMICTIMES.COM

Fri, 11 Sept 2020

India, France decide to expand cooperation in Indian Ocean Region

Synopsis

The Indian Navy has significantly expanded its deployment in the Indian Ocean Region, stationing a plethora of warships and submarines following the border row in eastern Ladakh to send across a message to Beijing.

New Delhi: Defence Minister Rajnath Singh and his French counterpart Florence Parly on Thursday held extensive talks during which they vowed to step up cooperation in the Indian Ocean, a region which is witnessing rising Chinese military posturing.

The two ministers emphasised the need to work closely keeping in view the joint strategic vision of India-France cooperation in the Indian Ocean region.

It is learnt that Singh also apprised Parly on India's four-month-long border row with China in eastern Ladakh.

Official sources said the two sides reviewed the entire gamut of bilateral cooperation and exchanged views on contemporary regional and global security issues of mutual interest.

The two ministers emphasised the need to work closely keeping in view the joint strategic vision of India-France cooperation in the Indian Ocean region, the sources said.

The talks took place at Ambala Air Force station after a ceremony marking induction of five Rafale jets into the Indian Air Force.

Singh and Parly held a brief conversation at the Air Force station in Palam in Delhi shortly after her arrival on Thursday morning.

The Indian Navy has significantly expanded its deployment in the Indian Ocean Region, stationing a plethora of warships and submarines following the border row in eastern Ladakh to send across a message to Beijing.

The maritime space around the Malacca Strait is very critical for China's supply chain through sea routes.

After returning to Delhi in the afternoon, Parly held talks with National Security Advisor Ajit Doval focusing on ways to further boost bilateral defence and security cooperation, officials said.

In her brief address at the ceremony, Parly said France is fully committed to integrate the Indian defence industry with France's global military supply chain, while calling the induction of the Rafale jets into the IAF a new chapter in bilateral defence ties.

"The strategic partnership between France and India is based on common values and friendship forged over several decades," she said.

"Since India's independence, our two democracies have been cooperating very closely. France has always stood beside India in good and bad times," she said.

In Delhi, Parly visited the national war memorial and paid tributes to India's fallen heroes.

https://economictimes.indiatimes.com/news/defence/india-france-decide-to-expand-cooperation-in-indian-ocean-region/articleshow/78043160.cms

Science & Technology News

PHYS.ORG

Fri, 11 Sept 2020

Scientists predict new superhard materials

A group of Skoltech scientists used machine learning (ML) methods to predict superhard materials based on their crystal structure.

The research was published in the *Journal of Applied Physics*.

Credit: Pixabay/CC0 Public Domain

Superhard materials have recently attracted increasing research interest due to their potential implications for industries broadly ranging from oil production to high technology manufacturing. A superhard material has two crucial features, hardness and fracture toughness, that represent its resistance to deformation and crack propagation, respectively.

Materials with properties that would suit specific industry requirements can be found computationally using advanced methods of computational materials science backed by a good theoretical model to calculate the desired properties for superhard materials.

Efim Mazhnik, a Ph.D. student at the Skoltech Center for Energy Science and Technology (Computational Materials Discovery Laboratory), guided by Skoltech and MIPT professor Artem R. Oganov, succeeded in building such a model using convolutional neural networks (CNN) on graphs, an ML method that enables predicting a material's properties from its crystal structure. Using a set of materials with known properties, you can teach CNN to calculate those properties for previously unfamiliar structures.

"Faced with a lack of experimental data on hardness and fracture toughness to properly train the models, we turned to more abundant data on elastic moduli and predicted their values to obtain the sought-for properties using the physical model we had created earlier," says Efim Mazhnik.

"In this study, we applied ML methods to calculate hardness and fracture toughness for over 120,000 crystal structures, both known and hypothetical, most of which have never been explored in terms of these properties. While our model confirms that diamond is the hardest known material, it suggests the existence of several dozen other potentially very hard or superhard materials," says Artem Oganov.

More information: Efim Mazhnik et al. Application of machine learning methods for predicting new superhard materials, *Journal of Applied Physics* (2020). DOI: 10.1063/5.0012055

Journal information: *Journal of Applied Physics*

https://phys.org/news/2020-09-scientists-superhard-materials.html

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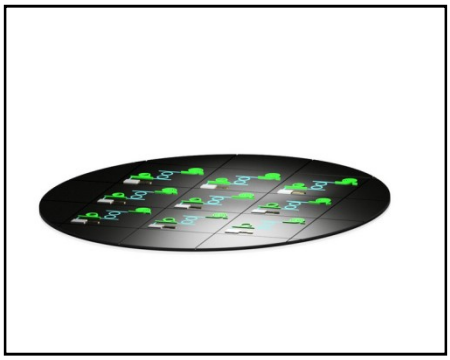
Fri, 11 Sept 2020

New light amplifier can boost the potential of photonics

A new light amplifier developed at the University of Twente not only boosts the light signals on a photonic chip, but it also enhances the applicability of those chips. Thanks to stronger light signals, detector chips for viruses or tumor markers can be made more sensitive, and autonomous cars could better scan their surroundings. One of the major advantages of the new amplifier is its small size. For preparing this concept for market introduction, Professor Sonia Garcia Blanco received a Proof of Concept grant of the European Research Council

Photonic integrated circuits (PICs) are being introduced in a growing number of applications. These components process light signals. PICs can be found in medical detection, in datacenters and 5G signal processing. And the autonomous cars of the future heavily depend on LIDAR (light detection and ranging). The stronger the output signal, the better the car will be able to correctly evaluate its surroundings. As in electronics, optical amplifiers boost optical signals. However, in the case of photonics, amplifiers are not often integrated onto the same chip and thus need to be connected separately, which can make the system lossy and vulnerable. Sonia Garcia Blanco and her team have now developed an amplifier that overcomes these disadvantages. It makes use of the combination of aluminum oxide and erbium, and an innovative coupling technique.



Wafer with both passive components of silicon nitride and the new amplifiers of erbium-doped aluminum oxide. Credit: University of Twente

Double layer

Erbium is often used in fiber optical amplifiers (EDFAs), but this mostly results in bulky components. Thanks to the correct combination of material, erbium concentration and waveguide architecture, the amplifier can be made very small, while providing high optical gain. A major question is how to connect the amplifier with the rest of the photonic circuit. This is achieved by using a double photonic layer coupler technology developed in Garcia-Blanco's group. A special tapering design permits transferring the light back and forth between the passive silicon nitride photonic circuit and the amplifier section with negligible loss. In this way, the amplifier section becomes a building block that can be introduced by chip designers into any photonic chip that

requires amplification. It resembles the way electronic building blocks can be introduced on every part of an electronic chip.

Garcia Blanco says, "Our optical gain building block addresses the current problems of performance, scalability and flexibility."

https://phys.org/news/2020-09-amplifier-boost-potential-photonics.html

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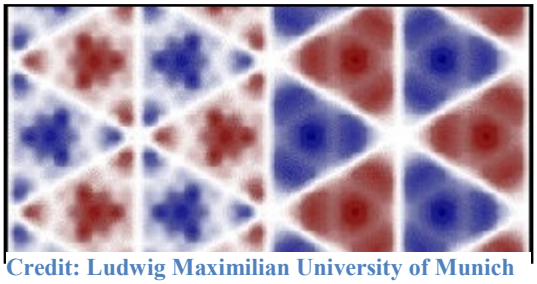
Fri, 11 Sept 2020

Spectral classification of excitons

Ultrathin layers of tungsten diselenide have potential applications in opto-electronics and quantum technologies. LMU researchers have now explored how this material interacts with light in the presence of strong magnetic fields.



Credit: Ludwig Maximilian University of Munich

Owing to their astonishing and versatile properties, atomically thin monolayer and bilayer forms of semiconducting transition metal dichalcogenides have aroused great interest in recent years. Most attention has so far been paid to the optical properties of these materials, such as molybdenum sulfide (MoS) and tungsten diselenide (WSe_2). These compounds show great promise as nanoscale elements for applications in opto-electronic and quantum technologies.

In a new study, LMU physicists led by Alexander Högele have now developed a theoretical model, which describes the effects of magnetic fields on the behavior of excitons in two-dimensional ultrathin transition metal dichalcogenides. Excitons are strongly bound quasiparticles, composed of an electron in the conduction band and its positively charged counterpart in the valence band referred to as a hole. In the presence of strong magnetic fields, the energy states of such quasiparticles (i.e. the frequencies at which they emit and absorb light) split up. This spectral splitting can be experimentally measured and—more importantly in the present context—it can also be theoretically predicted.

In the study, the team cooled monolayer and bilayer samples of WSe_2 to the temperature of liquid helium of a few degrees Kelvin. The researchers then used optical spectroscopy to measure the emission spectra as a function of magnetic field up to 9 Tesla and determined the field-induced splitting. "Measurements like this are useful to study excitons, which in turn determine the light-matter interaction of semiconductors," Högele explains.

It was already known that excitons can form in different configurations. In addition to bright excitons, which couple directly to light, the pairing of electrons and holes can produce spin-dark and momentum-dark excitons. Up to now, it has not been possible to conclusively assign the signatures observed in emission spectra to these different exciton species. In the presence of magnetic field, however, individual emission peaks exhibit characteristic spectral splittings. "This splitting can be used to discriminate between the various types of excitons," says Högele, "but only if we have the according theoretical model." The LMU team developed theory to calculate from first principles the spectral splitting for the different types of excitons in monolayer and bilayer WSe_2 subjected to magnetic field, and compared their theoretical predictions with the experimental data.

The results provide a better understanding of the opto-electronic properties of WSe_2 and related transition-metal dichalcogenides where excitons represent the primary interface for light to interact with nanoscale matter. Ultrathin layers of WSe_2 serve as a testbed for technological exploitations of light-matter coupling in opto-electronic devices including photodetectors and emitters or

photovoltaic devices. "These ultrathin materials are mechanically flexible and extremely compact," says Högele. They are also potentially viable for quantum technologies as they host valleys as quantum degrees of freedom that can serve as qubits, the basic units of information processing in quantum computers.

More information: Jonathan Förste et al. Exciton g-factors in monolayer and bilayer WSe_2 from experiment and theory, *Nature Communications* (2020). DOI: 10.1038/s41467-020-18019-1

Journal information: *Nature Communications*

https://phys.org/news/2020-09-spectral-classification-excitons.html

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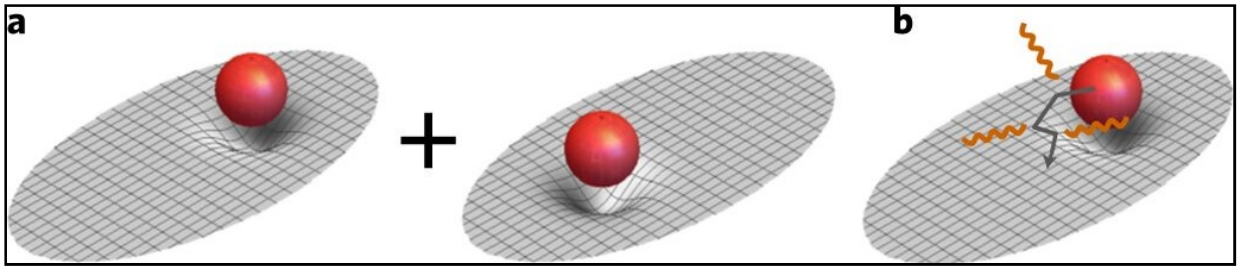
Fri, 11 Sept 2020

Test of wave function collapse suggests gravity is not the answer

By Bob Yirka

A team of researchers from Germany, Italy and Hungary has tested a theory that suggests gravity is the force behind quantum collapse and has found no evidence to support it. In their paper published in the journal *Nature Physics*, the researchers describe underground experiments they conducted to test the impact of gravity on wave functions and what their work showed them. Myungshik Kim, with Imperial College London has published a News & Views piece in the same issue, outlining the work by the team and the implications of their results.



The Diósi–Penrose (DP) model of gravity-related wave function collapse. a, According to quantum gravity, a spatial quantum superposition of a system (red sphere) generates a superposition of different spacetime curvatures (grey sheets), corresponding to the possible different locations of the system. Penrose argues that a superposition of different spacetimes is unstable and decays in time, making the system's wave function also collapse. He provides an estimate for the time of collapse as given in equation (1), which is faster for a larger system, similar to that suggested earlier by Diósi. b, The master equation of the DP model (equation (3)) predicts not only the collapse of the wave function, but also an omnipresent Brownian-like diffusion (represented by the grey arrow) for each constituent of the system. When the constituents are charged (protons and electrons), the diffusion is accompanied by the emission of radiation (wavy orange lines), with a spectrum that depends on the configuration of the system. This is given by equation (4) in the range $\Delta E = (10–10^5)$ keV of photon energies. The predicted radiation emission is faint but potentially detectable by an experiment performed in a very low-noise environment. We performed such an experiment to rule out the original parameter-free version of the DP model. Credit: *Nature Physics* (2020). DOI: 10.1038/s41567-020-1008-4

Quantum physics suggests that the state of an object depends on its properties and the way it is measured by an observer; the thought experiment involving Schrödinger's cat is perhaps the most famous example. But the theory is not universally accepted—physicists have wrangled for many years over the notion, with some arguing that it seems a bit too anthropocentric to be real. Behind the theory is the concept of waveform collapse, by which the observation of a particle, as an example, makes it collapse. To help make sense of the idea, some physicists have suggested that the force behind waveform collapse is not a person taking a look at a particle, but gravity. They suggest that gravitational fields exist outside of quantum theory and resist being forced into awkward combinations such as superpositions. A gravitational field forced to do so soon collapses, taking the particle with it. In this new effort, the researchers devised an experiment to test this theory in a physical sense.

The experiment consisted of building a small crystal detector made from germanium and using it to detect gamma and X-ray emissions from protons in the nuclei of the germanium. But before running the experiment, they wrapped the detector in lead and dropped it into a facility 1.4 kilometers below ground level at the Gran Sasso National Laboratory in Italy to prevent as much extraneous radiation from reaching the sensor as possible. After two months of testing, the team recorded far fewer photon hits than theory would suggest—indicating that the particles were not collapsing due to gravity, as theory had suggested.

More information: Sandro Donadi et al. Underground test of gravity-related wave function collapse, *Nature Physics* (2020). DOI: 10.1038/s41567-020-1008-4

M. S. Kim. A massive test, *Nature Physics* (2020). DOI: 10.1038/s41567-020-1026-2

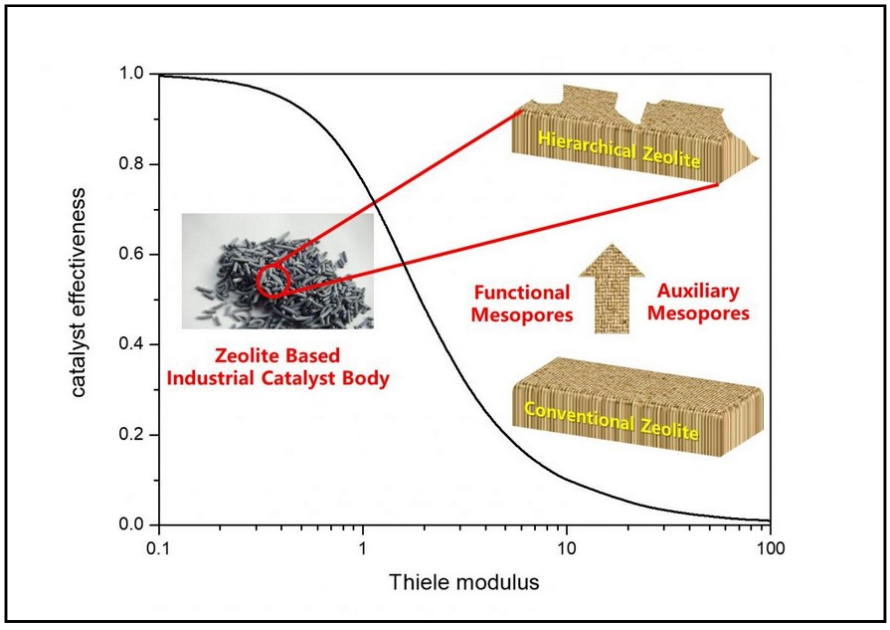
Journal information: *Nature Physics*

https://phys.org/news/2020-09-function-collapse-gravity.html

Fri, 11 Sept 2020

Rationally designing hierarchical zeolites for better diffusion and catalyst efficiency

Thanks to various crystalline topologies, tunable chemical composition, high (hydro) thermal stability, and controllable surface acidity/basicity, zeolites are widely used in petroleum refining, petrochemical manufacture, fine chemical synthesis, biomedicine, environmental chemistry, etc. However, for many zeolite-catalyzed reactions, the molecular diameters of the reaction species involved are often larger than the pore apertures of the zeolites. This leads to undesired diffusion resistance between the bulk phase and the active centers of the catalyst, thereby significantly reducing the catalyst efficiency.



Hierarchical structures at both zeolitic component and industrial catalyst levels Credit: Science China Press

Alleviating diffusion resistance and improving catalyst efficiency of the zeolite-based catalyst is always one of the most concerned issues in academia and industry. Within the past decades, tools for integrating hierarchical micro-/mesoporous structures into zeolites for better diffusion and catalyst efficiency have been greatly enriched.

However, in the real industrial catalysis processes, even if zeolitic component contains hierarchically porous structure, it is just one of the components of the multi-component industrial catalyst. The zeolite-based industrial catalyst is essentially hierarchical structure composed of microporous zeolitic and macroporous non-zeolitic components. When the hierarchically porous structure is integrated, the catalyst also has a micro-/meso-/macroporous trimodal hierarchical structure. Obviously, the hierarchical pore structure of industrial zeolite-

based catalysts exists in two levels: 'inside the zeolitic component' and 'between the components of the industrial catalyst.'

In a new review paper published in the Beijing-based *National Science Review*, scientists at the China University of Petroleum in Qingdao, China (Peng Peng, Zi-Feng Yan), China National Petroleum Company in Beijing, China (Xiong-Hou Gao), and French National Center for Scientific Research (CNRS) in Caen, France (Svetlana Mintova) analyzed the state-of-the-arts in rational design of hierarchical micro-/mesoporous structures from catalytic reaction engineering point of view.

From the perspective of catalytic reaction engineering, the quantitative indicators for evaluating catalyst efficiency are catalyst effectiveness factor (η) and Thiele modulus (φ). If the catalyst system undergoes strong diffusion resistance (η<0.25), then η is the reciprocal of φ, so increased η means decreased φ. Based on the definition of φ, enhancing η can be achieved by either increasing the effective diffusion coefficient (Deff) or shortening the diffusion path (L). Based on this, the mesoporous structure in hierarchical zeolite can be divided into three types: (1) 'functional mesopores' (increase effective diffusion coefficient, Deff); (2) 'auxiliary mesopores' (shorten the diffusion path, L); and (3) 'integrated mesopores' (simultaneously increase Deff and shorten L). For hierarchical zeolite materials, excellent pore interconnectivity can ensure rapid diffusion and desorption of products formed on the active sites of the micropores, thereby avoiding deactivation. For a cascade reaction network like fluid catalytic cracking (FCC), well-designed hierarchically porous structure can ensure the interconnection between micro- and mesopores, which is very important for the reaction relay in FCC process.

Zeolite with a hierarchical porous structure is just one of the components of real industrial catalysts. In order to meet the requirements of mechanical strength, hydrothermal stability, resistance to poisoning and coking in the industrial catalytic processes, industrial catalysts need to add other non-zeolitic components. Although the interaction mechanism between the industrial catalyst components is not fully understood, the non-ideal matching of the porous structures between the zeolitic and the non-zeolite components can cause reducing performance of the hierarchical pore zeolite components. The coordination of pores interconnectivity of hierarchical zeolites and other non-zeolitic components in industrial catalysts is an urgent issue to be addressed prior the industrial applications of hierarchical zeolites.

The ultimate goal for preparing hierarchically porous material is to fully release its potential at industrial scale by controlling the hierarchical pore structure, different components' locations and interconnectivity that play a pivotal role on enhancing of their catalytic efficiency. Developing combined in-situ or operando spectroscopic, microscopic or diffraction techniques is the key to unravel the structure-activity relationship of hierarchical zeolites as a component in industrial catalysts.

More information: Peng Peng et al, Diffusion and catalyst efficiency in hierarchical zeolite catalysts, *National Science Review* (2020). DOI: 10.1093/nsr/nwaa184

https://phys.org/news/2020-09-rationally-hierarchical-zeolites-diffusion-catalyst.html

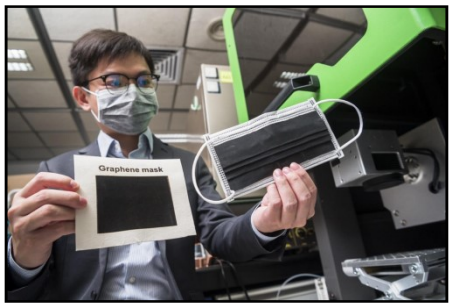
PHYS.ORG

Fri, 11 Sept 2020

Researchers develop anti-bacterial graphene face masks

Face masks have become an important tool in fighting against the COVID-19 pandemic. However, improper use or disposal of masks may lead to "secondary transmission". A research team from City University of Hong Kong (CityU) has successfully produced graphene masks with an anti-bacterial efficiency of 80%, which can be enhanced to almost 100% with exposure to sunlight for around 10 minutes. Initial tests also showed very promising results in the deactivation of two species of coronaviruses. The graphene masks are easily produced at low cost, and can help to resolve the problems of sourcing raw materials and disposing of non-biodegradable masks.

The research is conducted by Dr. Ye Ruquan, Assistant Professor from CityU's Department of Chemistry, in collaboration with other researchers. The findings were published in the scientific journal *ACS Nano*, titled "*Self-Reporting and Photothermally Enhanced Rapid Bacterial Killing on a Laser-Induced Graphene Mask*".



Dr Ye's team uses the CO2 infrared laser system to generate graphene. Experiment results show that the graphene they produced exhibit a much better anti-bacterial efficiency than activated carbon fibre and melt-blown fabrics. Credit: City University of H

Commonly used surgical masks are not anti-bacterial. This may lead to the risk of secondary transmission of bacterial infection when people touch the contaminated surfaces of the used masks or discard them improperly. Moreover, the melt-blown fabrics used as a bacterial filter poses an impact on the environment as they are difficult to decompose. Therefore, scientists have been looking for alternative materials to make masks.

Converting other materials into graphene by laser

Dr. Ye has been studying the use of laser-induced graphene in developing sustainable energy. When he was studying Ph.D. degree at Rice University several years ago, the research team he participated in and led by his supervisor discovered an easy way to produce graphene. They found that direct writing on carbon-containing polyimide films (a polymeric plastic material with high thermal stability) using a commercial CO_2 infrared laser system can generate 3-D porous graphene. The laser changes the structure of the raw material and hence generates graphene. That's why it is named laser-induced graphene.

Graphene is known for its anti-bacterial properties, so as early as last September, before the outbreak of COVID-19, producing outperforming masks with laser-induced graphene already came across Dr. Ye's mind. He then kick-started the study in collaboration with researchers from the Hong Kong University of Science and Technology (HKUST), Nankai University, and other organizations.

Excellent anti-bacterial efficiency

The research team tested their laser-induced graphene with E. coli, and it achieved high anti-bacterial efficiency of about 82%. In comparison, the anti-bacterial efficiency of activated carbon fiber and melt-blown fabrics, both commonly-used materials in masks, were only 2% and 9% respectively. Experiment results also showed that over 90% of the E. coli deposited on them remained alive even after 8 hours, while most of the E. coli deposited on the graphene surface were

dead after 8 hours. Moreover, the laser-induced graphene showed a superior anti-bacterial capacity for aerosolised bacteria.

Dr. Ye said that more research on the exact mechanism of graphene's bacteria-killing property is needed. But he believed it might be related to the damage of bacterial cell membranes by graphene's sharp edge. And the bacteria may be killed by dehydration induced by the hydrophobic (water-repelling) property of graphene.

Previous studies suggested that COVID-19 would lose its infectivity at high temperatures. So the team carried out experiments to test if the graphene's photothermal effect (producing heat after absorbing light) can enhance the anti-bacterial effect. The results showed that the anti-bacterial efficiency of the graphene material could be improved to 99.998% within 10 minutes under sunlight, while activated carbon fiber and melt-blown fabrics only showed an efficiency of 67% and 85% respectively.

The team is currently working with laboratories in mainland China to test the graphene material with two species of human coronaviruses. Initial tests showed that it inactivated over 90% of the virus in five minutes and almost 100% in 10 minutes under sunlight. The team plans to conduct testings with the COVID-19 virus later.

Their next step is to further enhance the anti-virus efficiency and develop a reusable strategy for the mask. They hope to release it to the market shortly after designing an optimal structure for the mask and obtaining the certifications.

Dr. Ye described the production of laser-induced graphene as a "green technique". All carbon-containing materials, such as cellulose or paper, can be converted into graphene using this technique. And the conversion can be carried out under ambient conditions without using chemicals other than the raw materials, nor causing pollution. And the energy consumption is low.

"Laser-induced graphene masks are reusable. If biomaterials are used for producing graphene, it can help to resolve the problem of sourcing raw material for masks. And it can lessen the environmental impact caused by the non-biodegradable disposable masks," he added.

Dr. Ye pointed out that producing laser-induced graphene is easy. Within just one and a half minutes, an area of 100 cm^2 can be converted into graphene as the outer or inner layer of the mask. Depending on the raw materials for producing the graphene, the price of the laser-induced graphene mask is expected to be between that of surgical mask and N95 mask. He added that by adjusting laser power, the size of the pores of the graphene material can be modified so that the breathability would be similar to surgical masks.

A new way to check the condition of the mask

To facilitate users to check whether graphene masks are still in good condition after being used for a period of time, the team fabricated a hygroelectric generator. It is powered by electricity generated from the moisture in human breath. By measuring the change in the moisture-induced voltage when the user breathes through a graphene mask, it provides an indicator of the condition of the mask. Experiment results showed that the more the bacteria and atmospheric particles accumulated on the surface of the mask, the lower the voltage resulted. "The standard of how frequently a mask should be changed is better to be decided by the professionals. Yet, this method we used may serve as a reference," suggested Dr. Ye.

More information: Libei Huang et al, Self-Reporting and Photothermally Enhanced Rapid Bacterial Killing on a Laser-Induced Graphene Mask, *ACS Nano* (2020). DOI: 10.1021/acsnano.0c05330

Journal information: *ACS Nano*

https://phys.org/news/2020-09-anti-bacterial-graphene-masks.html

ScienceDaily

Fri, 11 Sept 2020

COVID-19 study links strict social distancing to much lower chance of infection

Summary:
Using public transportation, visiting a place of worship, or otherwise traveling from the home is associated with a significantly higher likelihood of testing positive with the coronavirus SARS-CoV-2, while practicing strict social distancing is associated with a markedly lower likelihood.

Using public transportation, visiting a place of worship, or otherwise traveling from the home is associated with a significantly higher likelihood of testing positive with the coronavirus SARS-CoV-2, while practicing strict social distancing is associated with a markedly lower likelihood, suggests a study from researchers at the Johns Hopkins Bloomberg School of Public Health.

For their analysis, the researchers surveyed a random sample of more than 1,000 people in the state of Maryland in late June, asking about their social distancing practices, use of public transportation, SARS-CoV-2 infection history, and other COVID-19-relevant behaviors. They found, for example, that those reporting frequent public transport use were more than four times as likely to report a history of testing positive for SARS-CoV-2 infection, while those who reported practicing strict outdoor social distancing were just a tenth as likely to report ever being SARS-CoV-2 positive.

The study is believed to be among the first large-scale evaluations of COVID-19-relevant behaviors that is based on individual-level survey data, as opposed to aggregated data from sources such as cellphone apps.

The results were published online on September 2 in *Clinical Infectious Diseases*.

"Our findings support the idea that if you're going out, you should practice social distancing to the extent possible because it does seem strongly associated with a lower chance of getting infected," says study senior author Sunil Solomon, MBBS, PhD, MPH, an associate professor in the Bloomberg School's Department of Epidemiology and an associate professor of medicine at Johns Hopkins School Medicine. "Studies like this are also relatively easy to do, so we think they have the potential to be useful tools for identification of places or population subgroups with higher vulnerability."

The novel coronavirus SARS-CoV-2 has infected nearly 27 million people around the world, of whom some 900,000 have died, according to the World Health Organization. In the absence of a vaccine, public health authorities have emphasized practices such as staying at home, and wearing masks and maintaining social distancing while in public. Yet there hasn't been a good way to monitor whether -- and among which groups -- such practices are being followed.

Solomon and colleagues, including first author Steven Clipman, a PhD candidate in the Bloomberg School's Department of International Health, quickly accessed willing survey participants via a company that maintains a large nationwide pool of potential participants as a commercial service for market research. The 1,030 people included in the study were all living in Maryland, which has logged more than 113,000 SARS-CoV-2 confirmed cases and nearly 3,700 confirmed deaths, according to the Maryland Department of Health.

The researchers asked the survey participants questions about recent travel outside the home, their use of masks, social distancing and related practices, and any confirmed infection with SARS-CoV-2 either recently or at all.

The results indicated that 55 (5.3 percent) of the 1,030 participants had tested positive for SARS-CoV-2 infection at any time, while 18 (1.7 percent) reported testing positive in the two weeks before they were surveyed.

The researchers found that when considering all the variables they could evaluate, spending more time in public places was strongly associated with having a history of SARS-CoV-2 infection. For example, an infection history was about 4.3 times more common among participants who stated that they had used public transportation more than three times in the prior two weeks, compared to participants who stated they had never used public transportation in the two-week period.

An infection history also was 16 times more common among those who reported having visited a place of worship three or more times in the prior two weeks, compared to those who reported visiting no place of worship during the period. The survey did not distinguish between visiting a place of worship for a religious service or other purposes, such as a meeting, summer camp or meal.

Conversely, those who reported practicing social distancing outdoors "always" were only 10 percent as likely to have a SARS-CoV-2 history, compared to those who reported "never" practicing social distancing.

An initial, relatively simple analysis linked many other variables to SARS-CoV-2 infection history, including being Black or Hispanic. But a more sophisticated, "multivariable" analysis suggested that many of these apparent links were largely due to differences in movement and social distancing.

"When we adjusted for other variables such as social distancing practices, a lot of those simple associations went away, which provides evidence that social distancing is an effective measure for reducing SARS-CoV-2 transmission," Clipman says.

The data indicated a greater adoption of social distancing practices among some groups who are especially vulnerable to serious COVID-19 illness, suggesting that they were relatively aware of their vulnerability. For example, 81 percent of over-65 participants reported always practicing social distancing at outdoor activities, while only 58 percent of 18-24 year olds did so.

The results are consistent with the general public health message that mask-wearing, social distancing, and limiting travel whenever possible reduce SARS-CoV-2 transmission. The researchers suggest, though, that studies such as these, employing similarly rapid surveys of targeted groups, could also become useful tools for predicting where and among which groups infectious diseases will spread most quickly.

"We did this study in Maryland in June, and it showed among other things that younger people in the state were less likely to reduce their infection risk with social distancing -- and a month later a large proportion of the SARS-CoV-2 infections detected in Maryland was among younger people," says Solomon. "So, it points to the possibility of using these quick, inexpensive surveys to predict where outbreaks are going to happen based on behaviors, and then mobilizing public health resources accordingly."

Solomon and his team are now conducting similar surveys in other states and are studying the surveys' potential as predictive epidemiological tools.

Support for the research and for some of the individual researchers came from the Johns Hopkins COVID-19 Research Response Program, the Burroughs Wellcome Fund, and the National Institutes of Health (DP2LM013102, DP2DA040244).

Story Source:

Materials provided by **Johns Hopkins University Bloomberg School of Public Health**. *Note: Content may be edited for style and length.*

Journal Reference:

1. Steven J Clipman, Amy P Wesolowski, Dustin G Gibson, Smisha Agarwal, Anastasia S Lambrou, Gregory D Kirk, Alain B Labrique, Shruti H Mehta, Sunil S Solomon. **Rapid real-time tracking of non-pharmaceutical interventions and their association with SARS-CoV-2 positivity: The COVID-19 Pandemic Pulse Study**. *Clinical Infectious Diseases*, 2020; DOI: 10.1093/cid/ciaa1313

https://www.sciencedaily.com/releases/2020/09/200910110824.htm

Medical Xpress

Fri, 11 Sept 2020

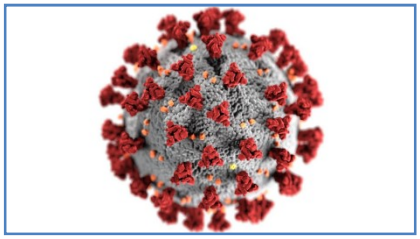
New tool outsmarts COVID-19 virus to help vaccine development

By Cheryl Critchley

Melbourne researchers have developed a tool to monitor mutations that make it difficult to develop coronavirus (COVID-19) vaccines and drugs.

Ensuring treatments remain effective as the virus mutates is a huge challenge for researchers. The powerful new tool harnesses genomic and protein information about the virus and its mutations to aid drug and vaccine development.

University of Melbourne Associate Professor David Ascher and his team at the Bio21 Molecular Science and Biotechnology Institute and the Baker Heart and Diabetes Institute developed the software tool and library, dubbed COVID-3-D.



COVID-3D contains information about all the protein structures that coincide with the SARS-CoV-2 (COVID-19) genome, including every known genetic mutation and its resultant mutant protein structure. Credit: Pexels

Published in *Nature Genetics*, COVID-3-D contains information about all the protein structures that coincide with the SARS-CoV-2 (COVID-19) genome, including every known genetic mutation and its resultant mutant protein structure.

"Although the SARS-CoV-2 virus is a relatively new pathogen, its ability to readily accumulate mutations across its genes was evident from the start of this pandemic," Associate Professor Ascher said.

"In the context of therapeutic drug design and discovery, these mutations, and the patterns by which they accumulate within the virus' protein structures, can affect the ability of vaccines and drugs to bind the virus, or to create a specific immune response against it. Because of this, scientists must not only try to control the virus, but outsmart it by predicting how it will change over time."

Several international universities and research institutions already use COVID-3-D in vaccine and treatment development.

"At Bio21 it is being used as part of ongoing efforts to understand and develop drugs to treat COVID-19," Associate Professor Ascher said.

To develop COVID-3-D, Professor Ascher's team analyzed the genome sequencing data of over 120,000 SARS-CoV-2 samples from infected people globally, including those that uniquely affect Australia, to identify mutations within each of the virus' proteins. They tested and analyzed the mutations' effects on their protein structure using computer simulations.

This data was used to calculate all the biological effects of every possible mutation within the genome. To help researchers account for possible future mutations, the team analyzed mutations in the related coronaviruses SARS-CoV and Bat RaTG13.

Mutations or changes in an organism's genetic material are natural "errors" in the cell replication process. They can give the virus new "powers" of survival, infectivity and virulence. Fortunately, the researchers found SARS-CoV-2 is mutating slower than other viruses such as influenza, with about two new changes in its genome every month.

COVID-3-D can help researchers recognize how mutations operate and identify more effective vaccine and drug targets.

"It is only when you know how a mutation will affect the 3-D shape of a protein, that you can predict if it will compromise your drug's ability to bind," Associate Professor Ascher said.

"As the global scientific and medical community gains better understanding of the biology behind the SARS-CoV2 infection and disease, this will be a powerful resource to predict problems with mutations and to guide the development of more effective therapies. COVID-3-D continues to be updated with new protein structures, mutations and analyses to keep ahead of mutations that cause problems and increasing our understanding of the SARS-CoV-2 mechanisms of disease."

More information: Stephanie Portelli et al. Exploring the structural distribution of genetic variation in SARS-CoV-2 with the COVID-3D online resource, *Nature Genetics* (2020). DOI: 10.1038/s41588-020-0693-3

Journal information: *Nature Genetics*

https://medicalxpress.com/news/2020-09-tool-outsmarts-covid-virus-vaccine.html

The Indian EXPRESS

Fri, 11 Sept 2020

After UK adverse event, Serum Institute halts India trials of Oxford vaccine candidate

The trials were halted by AstraZeneca after one participant, who reportedly took part in the phase 2/3 clinical trials underway in the United Kingdom, developed a "potentially unexplained illness"

By Prabha Raghavan

New Delhi: Serum Institute of India has decided to halt ongoing clinical trials in India of the Covid-19 candidate developed by The University of Oxford until AstraZeneca restarts its own global trials of the vaccine. The development comes a day after the Pune-headquartered firm announced that the Swedish-British drug giant's decision to pause the ongoing trials while it reviewed a potential safety concern would not impact the testing underway in India.

Covid-19 testing in New Delhi. SII is sponsoring mid- and late-stage human clinical trials for the vaccine candidate in India

The development comes a day after the Drug Controller General of India (DCGI) issued a show-cause notice to the Pune-based Serum Institute of India for failing to share the information about the pause on AstraZeneca vaccine. On Tuesday evening, AstraZeneca had announced that it was temporarily halting the global trials after one participant developed a "potentially unexplained illness".

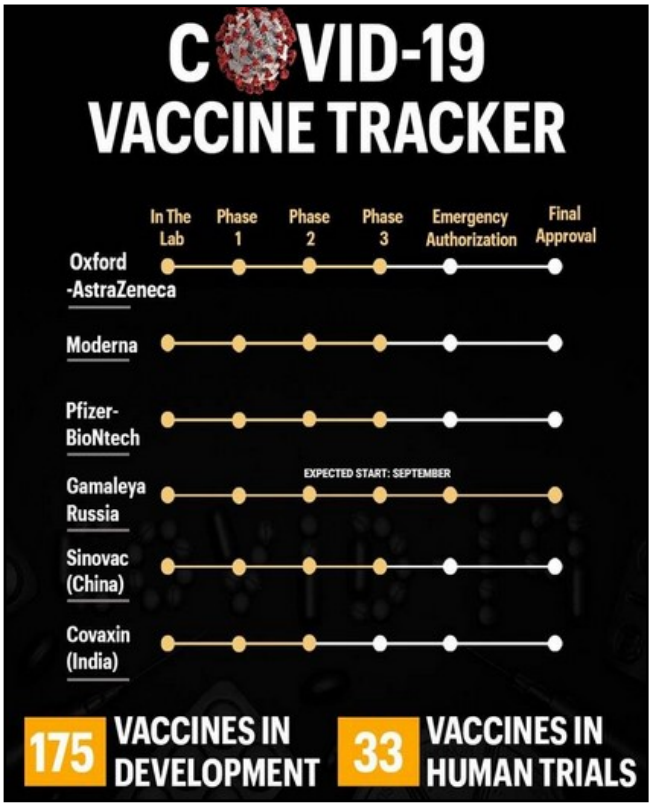
"We are reviewing the situation and pausing India trials till AstraZeneca restarts them. We are following DCGI's (Drug Controller General of India) instructions and will not be able to comment further on the same," Serum Institute said.

SII is sponsoring mid- and late-stage human clinical trials for the vaccine candidate in India. The candidate, named Covishield in India, was administered to a first set of volunteers on August 26.

AstraZeneca said it had "voluntarily paused vaccination" in its ongoing global trials to "allow review of safety data by an independent committee" after the event triggered its standard review process.

While the company did not specify which country had reported the adverse event, the issue is believed to have been flagged in the phase 2/3 clinical trials underway in the United Kingdom. A participant there reportedly had developed a serious spinal inflammatory syndrome called transverse myelitis.

One of the conditions for SII to conduct the trials in India had been that clinical data generated in India would be considered along with data from trials conducted by Oxford-AstraZeneca, the notice issued by DCGI Dr VG Somani on Wednesday had stated.



The regulator also noted that SII had not submitted a "causality analysis" of the serious adverse event "in light of safety concerns". Dr Somani had then asked SII for an immediate response as to why the regulator's permission to carry out the testing should not be suspended until patient safety was established. The chief had also threatened "action deemed fit" in the event that SII did not submit an immediate response.

Before this show-cause notice, SII's spokesperson had said earlier on Wednesday that, as far as Indian trials were concerned, "it is continuing and we have faced no issues at all".

The Pune firm, the world's largest manufacturer of vaccines, has been contracted by AstraZeneca and the University of Oxford to manufacture the vaccine for low- and middle-income countries.

Phase 2/3 trials of the candidate, called AZD1222 globally, have been ongoing in the UK since the end of May. On September 3, AstraZeneca announced that centres were recruiting up to 30,000 participants for phase 3 trials in the United States. Late stage trials are also continuing in Brazil and South Africa, and the company has planned early- to mid-stage trials in Japan and Russia.

Recruitment of participants in the India trials has already been on hold for the past week, as SII prepares to send the data collected from the first 100 participants who were administered the shot for safety reviews, The Indian Express has learnt.

https://indianexpress.com/article/india/oxford-astrazeneca-coronavirus-vaccine-serum-institute-halts-india-trials-covishield-6590670/