

July
2021

समाचार पत्रों से चयित अंश Newspapers Clippings

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

खंड : 46 अंक : 142 21 जुलाई 2021

Vol.: 46 Issue : 142 21 July 2021



रक्षा विज्ञान पुस्तकालय
Defence Science Library
रक्षा वैज्ञानिक सूचना एवं प्रलेखन केंद्र
Defence Scientific Information & Documentation Centre
मेटकॉफ हाउस, दिल्ली - 110 054
Metcalf House, Delhi - 110 054

CONTENTS

S. No.	TITLE	Page No.
DRDO News		1-14
DRDO Technology News		1-11
1.	DRDO indigenously develops high strength Beta Titanium Alloy on industrial scale	1
2.	डीआरडीओ ने औद्योगिक पैमाने पर स्वदेशी हाई स्ट्रेंथ बीटा टाइटेनियम मिश्र धातु विकसित की	2
3.	DRDO develops high strength titanium alloy for aerospace forgings	3
4.	DRDO develops high strength titanium alloy for aerospace forgings	4
5.	DRDO ने विकसित की एक नयी धातु, जानें इसकी मजबूती और क्या है इसका इस्तेमाल	5
6.	First MRSAM missile out for delivery to IAF	6
7.	First MRSAM missile out for delivery to IAF	7
8.	Bharat Dynamics Ltd flags off Medium Range Surface to Air Missile for delivery to Indian Air Force	8
9.	Russia, India to extend BrahMos supersonic missile's range to 800 km	9
10.	Complete integration of BrahMos missiles with India's Su-30 MKI Fighter Jets to be over in 2-3 years — Top official	9
11.	India is all set to expand its arsenal, by placing order for GE 404 Engines soon	11
COVID 19: DRDO's Contribution		12-13
12.	DRDO transfers technology to Produce COVID Drug 2-DG to 4 pharma companies	12
13.	डीआरडीओ ने कोरोना रोधी दवा 2डीजी की तकनीक चार फार्मा कंपनियों को हस्तांतरित की: सरकार	13
DRDO on Twitter		14-14
Defence News		15-24
Defence Strategic: National/International		15-24
14.	MoD issues RFP for construction of six P-75(I) submarines for Indian Navy	15
15.	रक्षा मंत्रालय ने भारतीय नौसेना के लिए छह पी-75 (I) पनडुब्बियों के निर्माण के लिए आरएफपी जारी किया	16
16.	Sarang to perform at Maks air show in Russia 20 July 2021	17
17.	सारंग 20 जुलाई 2021 से रूस में माक्स एयर शो में प्रदर्शन करेगी	18
18.	Indian Navy Chief Karambir Singh to attend Russian Navy Day celebrations next week	19
19.	Ministry of Defence tenders for six more submarines at \$1 billion each	20
20.	LoC, cameras, action — how hi-tech equipment is helping Indian Army guard the border better	22
21.	Russia hands over commercial offer of 21 MiG-29 fighter jets to India	24
Science & Technology News		25-33
22.	New low cost electrical contact material for thermoelectric devices	25
23.	थर्मोइलेक्ट्रिक डिवाइसों के लिए नया किफायती इलेक्ट्रिकल कॉन्टैक्ट मैटेरियल	26
24.	The origin of bifurcated current sheets explained	28
25.	Anomalous quantum transport phenomena observed in fractal photonic lattices	29
26.	Scientists shuffle atomic layers like playing cards to make new quantum materials	31
COVID-19 Research News		32-33
27.	IIT Ropar develops first-of-its-kind Oxygen rationing device - AMLEX	32
28.	आईआईटी, रोपड़ ने अपनी तरह की पहली ऑक्सीजन राशनिंग डिवाइस-एमलेक्स विकसित की	33



Press Information Bureau
Government of India

Ministry of Defence

Tue, 20 July 2021 12:36PM

DRDO indigenously develops high strength Beta Titanium Alloy on industrial scale

Defence Research and Development Organisation (DRDO) has indigenously developed a High Strength Metastable Beta Titanium Alloy containing Vanadium, Iron and Aluminium, Ti-10V-2Fe-3Al on industrial scale for applications in aerospace structural forgings. It has been developed by Defence Metallurgical Research Laboratory (DMRL), a premier Hyderabad based laboratory of DRDO. These alloys are already being used by many developed nations in recent times as beneficial substitute for the relatively heavier traditional Ni-Cr-Mo structural steels to achieve weight savings.

The excellent forgeability of high strength-to-weight ratio Ti-10V-2Fe-3Al alloy facilitates manufacture of intricately configured components for aerospace applications with potential for significant weight savings. Some of the components which may be forged from this alloy include slat/flap tracks, landing gear, and drop link in landing gear – among several others.

The high strength beta titanium alloys are unique due to their higher strength, ductility, fatigue, and fracture toughness – making them increasingly attractive for aircraft structural applications. Furthermore, their relatively lower lifetime cost, owing to superior corrosion resistance in comparison to steels, is an effective trade-off to justify the use of this expensive material in India too.

The DMRL has carried out raw material selection, alloy melting, thermo-mechanical processing, ultrasonics-based Non Destructive Evaluation (NDE), heat treatment, mechanical characterization, and type certification in active collaboration with several agencies.

Aeronautical Development Agency (ADA) has identified over 15 steel components which may be replaced by Ti-10V-2Fe-3Al alloy forgings in the near future with a potential of 40% weight savings. The landing gear drop link is the first component forged successfully by ADA at HAL, Bengaluru with DMRL's involvement and duly certified for airworthiness.

Raksha Mantri Shri Rajnath Singh has congratulated DRDO and the industry for indigenous development of High Strength Metastable Beta Titanium Alloy which will be useful for aerospace structural forgings.

Secretary, Department of Defence R&D and Chairman DRDO Dr G Satheesh Reddy applauded the dedicated efforts by the teams involved in the indigenous development of this technology.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1737118>





डीआरडीओ ने औद्योगिक पैमाने पर स्वदेशी हाई स्ट्रेंथ बीटा टाइटेनियम मिश्र धातु विकसित की

रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) ने एयरोस्पेस स्ट्रक्चरल फोर्जिंग में इस्तेमाल के लिए औद्योगिक पैमाने पर वैनेडियम, आयरन और एल्युमिनियम युक्त एक हाई स्ट्रेंथ मेटास्टेबल बीटा टाइटेनियम मिश्र धातु Ti-10V-2Fe-3Al विकसित की है। इसे रक्षा धातुकर्म अनुसंधान प्रयोगशाला (डीएमआरएल) द्वारा विकसित किया गया है, जो डीआरडीओ की हैदराबाद स्थित एक प्रमुख प्रयोगशाला है। हाल के दिनों में इन मिश्र धातुओं का उपयोग कई विकसित देशों द्वारा अपेक्षाकृत भारी पारंपरिक Ni-Cr-Mo संरचनात्मक स्टील्स के लाभकारी और कम वजन वाले विकल्प के रूप में किया जा रहा है।



उच्च शक्ति से वजन अनुपात Ti-10V-2Fe-3Al अलॉय की उत्कृष्ट फोर्जेबिलिटी वजन की महत्वपूर्ण बचत की क्षमता के साथ एयरोस्पेस अनुप्रयोगों के लिए जटिल रूप से विन्यस्त कलपुर्जों के निर्माण की सुविधा प्रदान करती है। इस मिश्र धातु से बनने वाले अनेक प्रकार के कलपुर्जों में से कुछ कलपुर्जे स्लैट/ फ्लैप ट्रेक, लैंडिंग गियर और लैंडिंग गियर में ड्रॉप लिंक हैं।

हाई स्ट्रेंथ बीटा टाइटेनियम मिश्र धातु अपनी उच्च शक्ति, लचीलेपन, फेटिग और फ्रैक्चर टफनेस के कारण अद्वितीय हैं - जो उन्हें विमान संरचनात्मक अनुप्रयोगों के लिए काफी बेहतर बनाते हैं। इसके अलावा, स्टील्स की तुलना में बेहतर संक्षारण प्रतिरोध के कारण उनकी अपेक्षाकृत कम जीवनकाल लागत, भारत में भी इस महंगी सामग्री के उपयोग को सही ठहराने के लिए प्रभावी है। डीएमआरएल ने कई एजेंसियों के साथ सक्रिय सहयोग में कच्चे माल का चयन, मिश्र धातु पिघलाने, थर्मो-मैकेनिकल प्रसंस्करण, अल्ट्रासोनिक-आधारित नॉन डिस्ट्रीक्टिव इवैल्यूएशन (एनडीई), हीट ट्रीटमेंट, मैकेनिकल करैक्टेराइज़ेशन और टाइप सर्टिफिकेशन किया है।

वैमानिकी विकास एजेंसी (एडीए) ने 15 से अधिक इस्पात कलपुर्जों की पहचान की है जिन्हें निकट भविष्य में 40 प्रतिशत वजन कम करने की क्षमता के साथ Ti-10V-2Fe-3Al मिश्र धातु फोर्जिंग द्वारा प्रतिस्थापित किया जा सकता है। लैंडिंग गियर ड्रॉप लिंक डीएमआरएल की भागीदारी के साथ एचएएल, बंगलुरु में एडीए द्वारा सफलतापूर्वक निर्मित और उड़ान योग्यता के लिए विधिवत प्रमाणित पहला घटक है।

रक्षा मंत्री श्री राजनाथ सिंह ने हाई स्ट्रेंथ मेटास्टेबल बीटा टाइटेनियम मिश्र धातु के स्वदेशी विकास के लिए डीआरडीओ और उद्योग को बधाई दी है जो एयरोस्पेस संरचनात्मक फोर्जिंग के लिए उपयोगी होगा।

रक्षा अनुसंधान एवं विकास विभाग के सचिव और डीआरडीओ के अध्यक्ष डॉ. जी सतीश रेड्डी ने इस तकनीक के स्वदेशी विकास में शामिल टीमों के समर्पित प्रयासों की सराहना की।

DRDO develops high strength titanium alloy for aerospace forgings

DMRL develops special steels and other super-alloys (such as those mixed with nickel) and then facilitates their commercial production by industrial units

By Ajai Shukla

The Defence Research and Development Organisation (DRDO) has announced the indigenous development of a “high strength metastable beta titanium alloy” on Tuesday. This will be produced on an industrial scale for making aerospace structural forgings.

The alloy has been developed by the Hyderabad-based Defence Metallurgical Research Laboratory (DMRL), one of the DRDO’s premier laboratories that carries out fundamental research in the field of materials science and technology. DMRL’s specified role is to develop and productionise metals, alloys, ceramics and their composites for advanced uses, such as in aircraft engines and aerostructures.

DMRL has announced that the new alloy, in which titanium is alloyed with vanadium, iron and aluminium, has an extraordinarily high strength-to-weight ratio. Several advanced countries already use this to manufacture intricate aerospace components, with significant weight savings over the relatively heavier structural steels in which iron is alloyed with nickel, chromium and molybdenum.

“The high strength beta titanium alloys are unique due to their higher strength, ductility, fatigue, and fracture toughness – making them increasingly attractive for aircraft structural applications. Furthermore, their relatively lower lifetime cost, owing to superior corrosion resistance in comparison to steels, is an effective trade-off to justify the use of this expensive material in India,” stated a Ministry of Defence (MoD) press release.

Another DRDO laboratory – the Aeronautical Development Agency (ADA) which oversees the Tejas fighter programme – has already identified over 15 steel components which may be replaced by the new titanium alloy forgings, with weight savings up to 40 per cent.

“The landing gear drop link is the first component forged successfully by ADA at Hindustan Aeronautics Ltd, Bengaluru, with DMRL’s involvement and duly certified for airworthiness,” said the DRDO.

DMRL develops special steels and other super-alloys (such as those mixed with nickel) and then facilitates their commercial production by industrial units. In cases where only a small and commercially unviable quantity is required, DMRL works with defence public sector undertaking (DPSU), Mishra Dhatu Nigam (MIDHANI), to develop economically viable production techniques.

In case the quantity required is high, such as for warship-grade steel, DMRL productionises the material through a non-defence, commercial unit, e.g. Steel Authority of India Ltd (SAIL).

Essentially, DMRL translates laboratory experiments into commercial production. This requires developing techniques to produce large batches entirely homogeneously.

“Productionisation means going from producing in kilos to producing in tons,” says a senior DMRL scientist.



DMRL has announced that the new alloy, in which titanium is alloyed with vanadium, iron and aluminium, has an extraordinarily high strength-to-weight ratio.

In this case, “DMRL has carried out raw material selection, alloy melting, thermo-mechanical processing, ultrasonics-based Non Destructive Evaluation (NDE), heat treatment, mechanical characterization, and type certification in active collaboration with several agencies,” said the DRDO.

https://www.business-standard.com/article/current-affairs/drdo-develops-high-strength-titanium-alloy-for-aerospace-forgings-121072001705_1.html



Wed, 21 July 2021

DRDO develops high strength titanium alloy for aerospace forgings

Landing gear drop link was first component forged successfully by ADA at HAL, Bengaluru

The Defence Research and Development Organisation (DRDO) has developed a high strength titanium alloy on industrial scale for applications in aerospace structural forgings.

“The high strength beta titanium alloys are unique due to their higher strength, ductility, fatigue, and fracture toughness – making them increasingly attractive for aircraft structural applications,” a DRDO statement said. Further, their relatively lower lifetime cost, owing to superior corrosion resistance in comparison to steels, was an effective trade-off to justify the use of this expensive material in India too, it stated.

The Aeronautical Development Agency (ADA) had identified over 15 steel components that may be replaced by the alloy forgings in the near future with a potential of 40% weight savings. “Some of the components which may be forged from this alloy include slat and flap tracks, landing gear and drop link in landing gear – among several others,” the DRDO said.

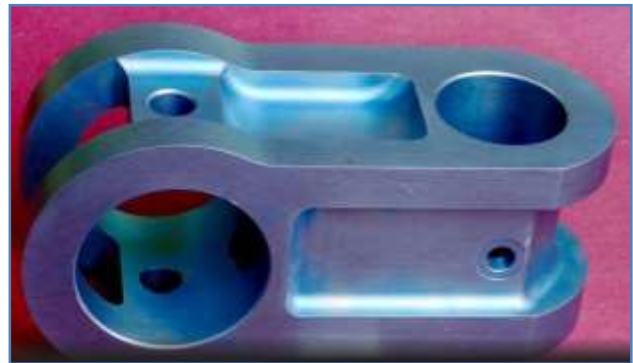
Beneficial substitute

The high strength metastable beta titanium alloy, Ti-10V-2Fe-3Al, containing Vanadium, Iron and Aluminium, was developed by the Defence Metallurgical Research Laboratory (DMRL). These alloys were being used by many developed nations in recent times as a beneficial substitute for the relatively heavier traditional structural steels to achieve weight savings, the statement said.

The landing gear drop link was the first component forged successfully by the ADA at HAL, Bengaluru, with the DMRL’s involvement and duly certified for airworthiness.

The excellent forgeability of high strength-to-weight ratio Ti-10V-2Fe-3Al alloy facilitated the manufacture of intricately configured components for aerospace applications with potential for significant weight savings, the statement added.

<https://www.thehindu.com/news/national/drdo-develops-high-strength-titanium-alloy-for-aerospace-forgings/article35421043.ece>



Aeronautical Development Agency had identified over 15 steel components that may be replaced by the alloy forgings in the near future with a potential of 40% weight savings. Photo: Special Arrangement



Aeronautical Development Agency had identified over 15 steel components that may be replaced by the alloy forgings in the near future with a potential of 40% weight savings. Photo: Special Arrangement



Wed, 21 July 2021

DRDO ने विकसित की एक नयी धातु, जानें इसकी मजबूती और क्या है इसका इस्तेमाल

डीआरडीओ के वैज्ञानिकों ने अब एक नयी धातु विकसित करने में सफलता पायी है। इस नयी धातु का नाम Ti-10V-2Fe-3Al रख गया है। इसका इस्तेमाल एयरोस्पेस स्ट्रक्चरल फोर्जिंग में होता है।

Edited By: प्रदीप शुक्ला

डीआरडीओ के वैज्ञानिकों ने अब एक नयी धातु विकसित करने में सफलता पायी है। इस नयी धातु का नाम Ti-10V-2Fe-3Al रख गया है। इसका इस्तेमाल एयरोस्पेस स्ट्रक्चरल फोर्जिंग में होता है। यह एक एल्युमिनियम युक्त एक हाई स्ट्रेंथ मेटास्टेबल बीटा टाइटेनियम मिश्र धातु है। इसे रक्षा धातुकर्म अनुसंधान प्रयोगशाला (डीएमआरएल) द्वारा विकसित किया गया है, जो डीआरडीओ की हैदराबाद स्थित एक प्रमुख प्रयोगशाला है।

इन मिश्र धातुओं का उपयोग हाल के दिनों में कई विकसित देशों द्वारा किया जा रहा है। यह देश अपेक्षाकृत भारी पारंपरिक Ni-Cr-Mo संरचनात्मक स्टील्स के लाभकारी और कम वजन वाले विकल्प के रूप में इसका इस्तेमाल कर रहे हैं।

अधिक शक्ति से वजन अनुपात Ti-10V-2Fe-3Al अलॉय की उत्कृष्ट फोर्जेबिलिटी वजन की महत्वपूर्ण बचत की क्षमता के साथ एयरोस्पेस अनुप्रयोगों के लिए जटिल रूप से महत्वपूर्ण स्पेयर पार्ट्स के निर्माण की सुविधा प्रदान करती है। इस मिश्र धातु से बनने वाले अनेक प्रकार के कलपुर्जों में से कुछ कलपुर्ज स्लैट/ फ्लैप ट्रेक, लैंडिंग गियर और लैंडिंग गियर में ड्रॉप लिंक हैं।

हाई स्ट्रेंथ बीटा टाइटेनियम मिश्र धातु अपनी उच्च शक्ति, लचीलेपन, फेटिग और फ्रैक्चर टफनेस के कारण अद्वितीय हैं - जो उन्हें विमान संरचनात्मक अनुप्रयोगों के लिए काफी बेहतर बनाते हैं। इसके अलावा, स्टील्स की तुलना में बेहतर संक्षारण प्रतिरोध के कारण उनकी अपेक्षाकृत कम जीवनकाल लागत, भारत में भी इस महंगी सामग्री के उपयोग को सही ठहराने के लिए प्रभावी है।

माल का चयन, मिश्र धातु पिघलाने, थर्मो-मैकेनिकल प्रसंस्करण, अल्ट्रासोनिक्स-आधारित नॉन डिस्ट्रीक्टिव इवैल्यूएशन (एनडीई), हीट ट्रीटमेंट, मैकेनिकल करैक्टेराइज़ेशन और टाइप सर्टिफिकेशन किया है।

वैमानिकी विकास एजेंसी (एडीए) ने 15 से अधिक इस्पात कलपुर्जों की पहचान की है जिन्हें निकट भविष्य में 40 प्रतिशतवजन कम करने की क्षमता के साथ Ti-10V-2Fe-3Al मिश्र धातु फोर्जिंग द्वारा प्रतिस्थापित किया जा सकता है। लैंडिंग गियर ड्रॉप लिंक डीएमआरएल की भागीदारी के साथ एचएएल, बेंगलुरु में एडीए द्वारा सफलतापूर्वक निर्मित और उड़ान योग्यता के लिए विधिवत प्रमाणित पहला घटक है।

रक्षा मंत्री श्री राजनाथ सिंह ने हाई स्ट्रेंथ मेटास्टेबल बीटा टाइटेनियम मिश्र धातु के स्वदेशी विकास के लिए डीआरडीओ और उद्योग को बधाई दी है जो एयरोस्पेस संरचनात्मक फोर्जिंग के लिए उपयोगी होगा।

<https://www.tv9hindi.com/utility-news/drdo-develops-new-metal-lighter-than-platinum-and-steel-useful-in-aviation-and-defense-744457.html>

First MRSAM missile out for delivery to IAF

By Ch Sushil Rao

Hyderabad: The first missile of the first firing unit of MRSAM (Medium Range Surface to Air Missile), for delivery to Indian Air Force, was flagged off by MSR Prasad, director general (Missiles & Strategic Systems) at BDL, Kanchanbagh Unit Hyderabad on Tuesday. BHVS Narayana Murthy, Director, Research Centre Imarat (RCI), Commodore Siddharth Mishra, (Retd), CMD, BDL, senior officials from DRDO and BDL were present on the occasion.

MSR Prasad, distinguished scientist and director general (Missiles and Strategic Systems), a government nominee director on BDL Board is retiring on attaining superannuation this month was felicitated by BDL in recognition of his contribution to the company's progress during his tenure. Speaking on the occasion, CMD, BDL expressed his gratitude to the services extended by DG (M&SS) as BDL board director and guided the company achieving its planned objectives.



The first missile of the first firing unit of MRSAM was flagged off at BDL, Kanchanbagh Unit Hyderabad on Tuesday.

Commodore Siddharth Mishra (Retd), CMD, BDL stated that MRSAM is one of the best examples of joint development of a weapon system. BDL has already completed the Navy order and now both Army and Air Force programme are moving simultaneously, he said.

MRSAM is a high response, quick reaction, vertically launched supersonic missile, designed to neutralise enemy aerial threats – missiles, aircraft, guided bombs, helicopters. Used by Army, Navy and Air Force as different variants, the missile has a range up to 70 km.

The missile system can provide point and area defence against various aerial targets including fighter aircraft, subsonic and supersonic cruise missiles. The missile is powered by indigenously developed dual-pulse rocket motor and dual control system to impart required manoeuvrability at the terminal phase. This state-of-art weapon system is designed with active radio frequency seeker to identify, track, engage and destroy the target with high kill probability.

DL is a manufacturer and supplier of guided missiles, underwater weapons, air-borne products and allied defence equipment for the Indian Armed Forces. As a part of its philosophy of providing product life cycle support, BDL has been supporting the Armed Forces with refurbishment / life extension of vintage missiles and obsolescence management.

<https://timesofindia.indiatimes.com/india/firing-unit-of-medium-range-surface-to-air-missile-ready-to-be-delivered-to-iaf/articleshow/84593943.cms>

First MRSAM missile out for delivery to IAF

The supersonic missile is designed to neutralise enemy aerial threats

Hyderabad: The first missile of the first firing unit of Medium Range Surface to Air Missile (MRSAM) for delivery to Indian Air Force was flagged off by BDL director general (missiles & strategic systems) M.S.R. Prasad at the Kanchanbagh unit here on Tuesday.

MRSAM is a high-response, quick-reaction, vertically-launched supersonic missile designed to neutralise enemy aerial threats — missiles, aircraft, guided bombs and helicopters. It is used by army, navy and air force as different variants and the missile has a range up to 70 km.

Chairman and managing director of BDL Commodore Siddharth Mishra (retired) stated that MRSAM is one of the best examples of joint development of a weapon system. The navy order has been completed and now both army and air force programme are moving simultaneously.

The missile system can provide point and area defence against various aerial targets including fighter aircraft, subsonic and supersonic cruise missiles. It is powered by indigenously developed dual-pulse rocket motor and dual control system to impart required manoeuvrability at the terminal phase, he said, in a press release.

It has been designed with active radio frequency seeker to identify, track, engage and destroy the target with high kill probability. BDL is a manufacturer and supplier of guided missiles, underwater weapons, air-borne products and allied defence equipment for armed forces.

“We are also aiming to expand its footprints in the international market by offering air to air missiles, anti-tank guided missiles, underwater weapons and counter measure systems in addition to Akash missiles to friendly countries,” said the CMD.

Mr Prasad, a distinguished scientist and a director on the BDL board, was felicitated on the occasion for his contribution to the firm’s progress as he will be superannuating this month. Director, Research Centre Imarat (RCI) B.H.V.S. Narayana Murthy and other senior officials of DRDO and BDL were present.

<https://www.thehindu.com/news/cities/Hyderabad/first-mrsam-missile-out-for-delivery-to-iaf/article35428691.ece>

Bharat Dynamics Ltd flags off Medium Range Surface to Air Missile for delivery to Indian Air Force

Bharat Dynamics Ltd flagged off the first unit of the Medium Range Surface to Air Missile for delivery to the Indian Air Force at its unit in Hyderabad on Tuesday

By Ashish Pandey

Hyderabad: The first missile of the first firing unit of the Medium Range Surface to Air Missile (MRSAM) was flagged off for delivery to the Indian Air Force from Bharat Dynamics Ltd's (BDL) Kanchanbagh unit in Hyderabad on Tuesday.

BDL has already completed its Navy order, and now both the Army and Air Force programmes are moving simultaneously.

The MRSAM is a high response, quick reaction, vertically launched supersonic missile, designed to neutralize enemy aerial threats. These threats include missiles, aircraft, guided bombs and helicopters. The missile has a range of up to 70 km and will be used by the Army, Navy and Air Force in different variants.

The missile system can provide point and area defence against various aerial targets including fighter aircraft, subsonic and supersonic cruise missiles.

The missile is powered by an indigenously developed dual-pulse rocket motor and a dual control system to impart the required maneuverability at the terminal phase.

This state-of-the-art weapon system has been designed with active radio frequency seeker to identify, track, engage and destroy the target with high kill probability.

BDL also aims to supply air-to-air missiles, anti-tank guided missiles, underwater weapons and counter measure systems in addition to Akash missiles to friendly countries.

<https://www.indiatoday.in/cities/hyderabad/story/bharat-dynamics-ltd-flags-off-medium-range-surface-to-air-missile-indian-air-force-1830611-2021-07-21>



BDL flagged off the first unit of the Medium Range Surface to Air Missile for delivery to the Indian Air Force on Tuesday. (Photo: Ashish Pandey)



Wed, 21 July 2021

Russia, India to extend BrahMos supersonic missile's range to 800 km

The BrahMos missile had an initial flight range of 280 km. After India joined the missile technology control regime, its range was extended to 450 km

Zhukovsky /Moscow Region/, July 20. /TASS/. The flight range of the Russian-Indian BrahMos supersonic missile will be extended to 800 km, a source in the defense industry told TASS at the MAKS-2021 air show on Tuesday.

"There are plans to extend the BrahMos flight range to 800 km at the next stage of its upgrade," the source said.

TASS has no official confirmation of this information yet.

The BrahMos missile had an initial flight range of 280 km. After India joined the missile technology control regime, the missile's range was extended to 450 km.

As the source specified, the new Brahmos version has "a lot of new items". In particular, it features a new booster.

The BrahMos missile has been developed by Russia's Research and Production Association of Machine-Building (the town of Reutov near Moscow) and India's Defense Research and Development Organization (DRDO). The missile's name comes from the names of two rivers: the Brahmaputra of India and the Moskva of Russia. The missile's first launch took place on June 12, 2001, from a coastal launcher. The missiles have been produced jointly by India and Russia.

<https://tass.com/defense/1315847>



Wed, 21 July 2021

Complete integration of BrahMos missiles with India's Su-30 MKI Fighter Jets to be over in 2-3 years — Top official

By Anupama Ghosh

The Indian Air Force's (IAF) Su-30MKI fighters will be re-armed with BrahMos missiles in the next two or three years, according to the co-director of BrahMos Aerospace, Alexander Maksichev.

The IAF had earlier signed a contract for the delivery of air-launched cruise missiles beginning January 2018. This variant of the BrahMos, considered the world's fastest supersonic cruise missile, was designed to equip approximately 40 Su-30MKI fighter aircraft.

The Su-30 MKI

The Sukhoi Su-30MKI is a multi-role fighter jet developed jointly by Russia's Sukhoi Design Bureau and India's Hindustan Aeronautics Limited (HAL). In 1996, the



Indian Army showcases its BrahMos missiles during a military parade.

Indian Defense Ministry had signed the first contract with the Russian state intermediary company Rosvooruzhenie for the delivery of Su-30MKI jets for the IAF.

The delivery was slated for the years 2002-2004. In 2000, another contract was signed for the licensed production of the Su-30MKi at the facilities of Hindustan Aeronautics Limited (HAL).

The aircraft has an aerodynamic airframe, that is made of titanium and high-intensity aluminum alloys. The cockpit can accommodate two pilots and is equipped with an integrated avionics suite consisting of an Elbit Su 967 head-up display (HUD), seven active-matrix liquid crystal displays (AMLCD), and primary cockpit instrumentation.

The aircraft combines a fly-by-wire (FBW) flight control system. Air-to-ground missile guidance is provided by a large monochromatic display screen located in the rear cockpit. The aircraft also has an N011M passive electronically scanned array radar, OLS-30 laser-optical locator system, and lightning target designation pod to lead the air-to-surface missile and laser-guided munitions.

The Su-30MKI can carry Vypel-manufactured R-27R, R-73, and R-77 air-to-air missiles, and rocket pods such as KAB-500 and KAB-1500 laser-guided bombs. The aircraft has two AI-31FP turbojet engines, and each engine is capable of generating a full afterburn thrust of 12,500kgf.

As of November 2017, IAF modified two Su-30MKI fighter jets for air-launched BrahMos cruise missiles, according to Russian news agency TASS.

The Brahmos Missile

The BrahMos cruise missile is developed by the BrahMos Aerospace, a joint venture of India's Defence Research and Development Organization (DRDO) and Russia's Mashinostroeyenia. The missile is named after two rivers, India's Brahmaputra and Russia's Moskva.

The BrahMos Aerospace was established after an inter-governmental agreement was signed between India and Russia in 1998. The first BrahMos missile was tested in 2001, and since then, the missile has been successfully tested from various platforms, including land, ships, air, and submarine.

The BrahMos has been derived from the Russian P-800 Oniks/Yakhont supersonic anti-ship cruise missile. Its propulsion is based on the Oniks and the guidance system has been developed by the BrahMos Aerospace.

The ship and land-based missiles can carry a conventional armor-piercing warhead weighing up to 200 kg, while the aerial variant can carry a warhead weighing up to 300 kg. The BrahMos can also track surface targets as low as 10m in altitude. The missile has a flight range of up to 290 km and can reach a speed of Mach3.

On March 12, 2018, India successfully test-fired a 290 km-range submarine-launched version of the BrahMos missile in the Bay of Bengal becoming the first country in the world to have this capability.

BrahMos to Counter China?

Amid the border stand-off with China since last year, the Indian armed forces conducted a series of successful tests of the BrahMos missile.

Experts noted the Army, Navy, and Air Force conducting back-to-back tests was a further sign of tri-service integration where the land, air, and sea assets worked together to display a joint deterrence.

Earlier in 2020, Su-30MKI equipped with BrahMos supersonic cruise missiles were also inducted at the airbase at Thanjavur. The presence of the Su-30MKI was deemed significant for the protection of the island territories and sea lines of communication in the Indian Ocean region.

The integration of the air-launched version was done indigenously by BrahMos Aerospace, HAL, and the IAF.

The Brahmos provides India with an edge in the high-altitude border, The National Interest noted. It said the missile has the ability to hit ground-based targets and mount precision

attacks against fixed installations such as radars, command centers, air bases as well as enemy missile batteries.

In 2018, the Indian Defense Ministry signed a deal with BrahMos Aerospace on the re-armament of 40 Su-30MKI jets with the BrahMos cruise missile system.

“Many of the Indian Air Force’s Su-30MKI fighters will be armed with BrahMos cruise missiles in 2-3 years. These jets are being modernized as planned by the IAF. New launcher for the missiles and support systems are installed on the jets as per the schedule,” Maksichev said.

The new missiles will significantly enhance the IAF’s strategic capacity to eliminate long-range targets in the Indian Ocean, the official added.

<https://eurasianimes.com/complete-integration-of-brahmos-missiles-with-indias-su-30-mki-fighter-jets-to-be-over-in-2-3-years-top-official/>



Wed, 21 July 2021

India is all set to expand its arsenal, by placing order for GE 404 Engines soon

India is ready to sign another major defense agreement with the United States (US), valued at \$ 700 million, to acquire the engines that will power the 83 Tejas Mk-1A light combat aircraft, contracted in January from the Hindustan Aeronautics Limited (HAL).

According to sources, all supply-related problems have been resolved and India will soon place an order for 100 of the GE 404 engines.

American engines already power the Mk-1 version of the LCA which is in service with the Indian Air Force and would be a perfect fit for the latest variant of the local fighter.



The contract with GE Aviation is expected to be signed this year, making it the largest defense agreement with the US since February 2020, when India placed orders for MH-60 Sikorsky Romeo multi-role helicopters and helicopters from Apache attack during a visit by then-President Donald Trump.

Based on the F404-GE-402, the F404-GE-IN20 is a model developed according to Indian specifications, for the HAL Tejas program. It equipped the pre-production and test specimens, as well as the previous Mk1 variant as standard.

This F404 model is the most powerful of the family, delivering 84 kn (more than 8,500 kg) of thrust at full post-combustion. It includes a higher airflow, higher thrust fan, a Full Authority Digital Electronic Control (FADEC) system, mono-crystalline turbine blades, and a wide variety of advanced features.

The F404 family of combat engines is one of the most successful in the history of military aviation. More than 4,000 F404 engines power various fighter jets from the United States Air Force, Navy and Marine Corps, as well as countries in Europe, Asia and Africa.

<https://www.eletimes.com/india-is-all-set-to-expand-its-arsenal-by-placing-order-for-ge-404-engines-soon>

DRDO transfers technology to Produce COVID Drug 2-DG to 4 pharma companies

Technology to produce anti-Covid-19 drug 2-Deoxy-D-Glucose oral powder or 2-DG has been transferred by the Defence research and development organization to four pharma companies other than Dr Reddy's, Ministry of Chemicals and Fertilizers told Lok Sabha on Tuesday.

2-DG was given emergency use authorization as adjunct therapy in moderate to severe Covid-19 patients. "The drug does not allow the virus to replicate. The RTPCR turns negative quickly and the scale of the severity is also reduced, enhancing recovery time," a *TOI* report quoted a doctor, who used the drug priced around Rs 990 per sachet, as saying.



As per the latest Sero survey, as many as 67.6 per cent of India's population above six years were found to have SARS-CoV-2 antibodies.

In addition to 2-DG, the Indian-made Baricitinib tablets too are now available in the city. This drug, which is supposed to be used in combination with Remdesivir, can be used in paediatric patients of two years of age too.

<https://www.freepressjournal.in/india/drdo-transfers-technology-to-produce-covid-drug-2-dg-to-4-pharma-companies>

डीआरडीओ ने कोरोना रोधी दवा 2डीजी की तकनीक चार फार्मा कंपनियों को हस्तांतरित की: सरकार

नयी दिल्ली: सरकार ने मंगलवार को लोकसभा में कहा कि रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) ने 2डीजी पर विनिर्माण और संचालन के लिए डॉ रेड्डी लैब के साथ साझेदारी की है और इस दवा की तकनीक चार और फार्मा कंपनियों को हस्तांतरित की है।

केंद्रीय रसायन एवं उर्वरक मंत्री मनसुख मांडविया ने एम के राघवन के प्रश्न के लिखित उत्तर में सदन को यह जानकारी दी और यह भी बताया कि एसआईआर की प्रयोगशाला केंद्रीय औषधि अनुसंधान संस्थान ने ओरल दवा उमीफेनोविर भी इस लिहाज से विकसित की है।

उन्होंने कहा कि डीआरडीओ ने सूचित किया है कि उन्होंने कोविड-19 के उपचार के लिए ओरल एंटीवायरल दवा के रूप में 2डीजी (2-डीऑक्सी डी-ग्लूकोज) विकसित की है। उन्होंने बताया कि दवा के चरण-2 के नैदानिक परीक्षण के अत्यंत विशिष्ट परिणामों एवं तीसरे चरण के अंतरिम विश्लेषण के आधार पर भारत के औषधि महानियंत्रक (डीसीजीआई) ने एक मई, 2021 को आपात स्थिति के लिए मध्यम से गंभीर कोविड-19 रोगियों में सहायक चिकित्सा के रूप में 2डीजी के इस्तेमाल की मंजूरी दे दी है। यह कोविड रोगियों में प्रभावी है।

मांडविया ने कहा कि मध्यम से गंभीर रोगियों में दवा के तीसरे चरण के नैदानिक परीक्षण की अंतिम रिपोर्ट अगले महीने के अंत तक उपलब्ध होने की उम्मीद है।

मंत्री के मुताबिक वैज्ञानिक और औद्योगिक अनुसंधान परिषद (सीएसआईआर) ने सूचित किया है कि सीएसआईआर-केंद्रीय औषधि अनुसंधान संस्थान ने ओरल दवा उमीफेनोविर विकसित की है जिसका नैदानिक परीक्षण पूरा कर लिया गया है। इसके अतिरिक्त सीएसआईआर की एक और प्रयोगशाला राष्ट्रीय अंतर्विषयक विज्ञान और प्रौद्योगिकी संस्थान (एनआईआईएसटी) ने ओरल दवा मोलनुपिरविर के लिए एक नयी प्रक्रिया विकसित की है।

<https://navbharattimes.indiatimes.com/india/drdo-transferred-the-technology-of-anti-corona-drug-2dg-to-four-pharma-companies/articleshow/84585833.cms>

DRDO on Twitter



Cmde Siddharth Mishra(Retd) CMD-BDL @CMDBDL · 17h

First Firing Unit Missile of MRSAM(IAF) was flagged off by DG (M&SS) at BDL today. MRSAM is one of the most successful programmes showcasing joint development of a Weapon System. @DefProdIndia @DRDO_India @DefenceMinIndia @IAF_MCC



ANI ✓
@ANI



DRDO has transferred the technology to produce 2DG drug, which was given emergency use authorization as adjunct therapy in moderate to severe COVID-19 patients, to 4 pharma companies other than Dr Reddy's: Ministry of Chemicals & Fertilizers in Lok Sabha

5:23 PM · Jul 20, 2021



Defence Strategic: National/International



Press Information Bureau
Government of India

Ministry of Defence

Tue, 20 July 2021 4:03PM

MoD issues RFP for construction of six P-75(I) submarines for Indian Navy

As a major initiative towards 'Make in India', Ministry of Defence (MoD) has issued Request of Proposal (RFP) for the first acquisition programme under the Strategic Partnership Model for construction of six AIP fitted Conventional Submarines named Project 75(India) [P-75(I)] for the Indian Navy, on July 20, 2021. The RFP was issued to shortlisted Strategic Partners (SPs) or Indian Applicant Companies for the project viz, M/s Mazagaon Dock Shipbuilders Limited (MDL) and M/s Larsen & Tubro (L&T). The project cost is over Rs 40,000 crore.

Project-75(I) envisages indigenous construction of six modern conventional submarines (including associated shore support, Engineering Support Package, training and spares package) with contemporary equipment, weapons & sensors including Fuel-Cell based AIP (Air Independent Propulsion Plant), advanced torpedoes, modern missiles and state of the art countermeasure systems. This would provide a major boost to the indigenous design and construction capability of submarines in India, in addition to bringing in the latest submarine design and technologies as part of the project.

Post receipt of responses to the Expression of Interest (EoI), shortlisting of potential Strategic Partners (SPs) and Foreign OEMs was undertaken. The shortlisted SPs to whom the RFP has been issued would be collaborating with any of the shortlisted Foreign OEMs viz, M/s Naval Group-France, M/s TKMS-Germany, M/s JSC ROE-Russia, M/s Daewoo Shipbuilding and Marine Engineering Co Ltd-South Korea and M/s Navantia-Spain. These five foreign firms are the world leaders in the field of conventional submarine design, construction and all other related technologies. The foreign OEMs will be the technology partner in the SP Model. Foreign OEMs will enable SP for construction of submarines, achieving high levels of indigenization, and ToT for various technologies. These OEMs would enable setting up of dedicated manufacturing lines for these submarines in India by providing ToT for submarine design and other technologies and make India the global hub for submarine design and production.

The project would not only aid in boosting the core submarine/ship building industry but would also greatly enhance manufacturing/industrial sector, especially the MSME by development of an industrial eco-system for manufacture of associated spares/systems/equipment related to submarines. In order to achieve these objectives, the RFP has key features like mandatory level of indigenous manufacture of platforms, ToT for design/ manufacture/ maintenance of submarines and a few critical equipment and systems, setting up of an eco-system in India for such indigenisation and incentivisation for other key technologies, etc.

The overall aim would be to progressively build indigenous capabilities in the public/private sector to design, develop and manufacture complex weapon systems for the future needs of the Armed Forces. This will be an important step towards meeting broader national objectives,

encouraging self reliance and aligning the defence sector with the 'Make in India' initiative of the Government.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1737191>



पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Tue, 20 July 2021 4:03PM

रक्षा मंत्रालय ने भारतीय नौसेना के लिए छह पी-75 (I) पनडुब्बियों के निर्माण के लिए आरएफपी जारी किया

'मेक इन इंडिया' की दिशा में एक प्रमुख पहल के रूप में रक्षा मंत्रालय (एमओडी) ने भारतीय नौसेना के लिए दिनांक 20 जुलाई, 2021 को प्रोजेक्ट 75 (इंडिया) P-75(I) नामक छह एआईपी फिटेड पारंपरिक पनडुब्बियों के निर्माण के लिए रणनीतिक साझेदारी मॉडल के तहत पहले अधिग्रहण कार्यक्रम के लिए प्रस्ताव का अनुरोध (आरएफपी) जारी किया है। परियोजना के लिए चयनित रणनीतिक साझेदारों (एसपीएस) या भारतीय आवेदक कंपनियों जैसे मैसर्स मझगांव डॉक शिपबिल्डर्स लिमिटेड (एमडीएल) और मैसर्स लार्सन एंड टुब्रो (एल एंड टी) को आरएफपी जारी किया गया था। इस परियोजना की लागत 40,000 करोड़ रुपये से अधिक है।

प्रोजेक्ट-75(I) में फ्यूल-सेल आधारित एयर इंडिपेंडेंट प्रोपल्शन प्लांट, उन्नत टॉरपीडो, आधुनिक मिसाइल और अत्याधुनिक काउंटरमेजर सिस्टम सहित समकालीन उपकरण, हथियार और सेंसर के साथ छह आधुनिक पारंपरिक पनडुब्बियों (एसोसिएटेड शोर सपोर्ट, इंजीनियरिंग सपोर्ट पैकेज, प्रशिक्षण और पुर्जो सम्बंधी पैकेज समेत) के स्वदेशी निर्माण का लक्ष्य तय किया गया है। यह प्रोजेक्ट के अंतर्गत नवीनतम पनडुब्बी डिजाइन और प्रौद्योगिकियों को लाने के अलावा, भारत में पनडुब्बियों की स्वदेशी डिजाइन और निर्माण क्षमता को एक बड़ा बढ़ावा देगा।

एक्सप्रेसन ऑफ इंट्रेस्ट (ईओआई) पर प्रतिक्रियाओं की प्राप्ति के बाद, संभावित रणनीतिक भागीदारों (एसपी) और विदेशी ओईएम की शॉर्टलिस्टिंग की गई। शॉर्टलिस्ट किए गए रणनीतिक भागीदार (एसपी) जिन्हें आरएफपी जारी किया गया है, वे किसी भी शॉर्टलिस्ट किए गए विदेशी ओईएम जैसे मैसर्स नेवल ग्रुप-फ्रांस, मैसर्स टीकेएमएस-जर्मनी, मैसर्स जेएससी आरओई-रूस, मैसर्स देवू शिपबिल्डिंग और मरीन इंजीनियरिंग कंपनी लिमिटेड-दक्षिण कोरिया और मैसर्स नवंतिया-स्पेन के साथ सहयोग करेंगे। यह पांच विदेशी कंपनियां पारंपरिक पनडुब्बी डिजाइन, निर्माण और अन्य सभी संबंधित प्रौद्योगिकियों के क्षेत्र में विश्व की अग्रणी कंपनियां हैं। विदेशी ओईएम एसपी मॉडल में प्रौद्योगिकी भागीदार होंगे। विदेशी ओईएम एसपी को पनडुब्बियों के निर्माण, उच्च स्तर के स्वदेशीकरण और विभिन्न प्रौद्योगिकियों के लिए टीओटी प्राप्त करने योग्य बनाएंगे। ये ओईएम पनडुब्बी डिजाइन और अन्य प्रौद्योगिकियों के लिए टीओटी प्रदान करके भारत में इन पनडुब्बियों के लिए समर्पित विनिर्माण लाइन स्थापित करने में सक्षम होंगे और भारत को पनडुब्बी डिजाइन और उत्पादन के लिए वैश्विक केंद्र बनाएंगे।

यह परियोजना न केवल मुख्य पनडुब्बी/जहाज निर्माण उद्योग को बढ़ावा देने में मदद करेगी, बल्कि पनडुब्बियों से संबंधित पुर्जो/ सिस्टम/ उपकरणों के निर्माण के लिए एक औद्योगिक पारिस्थितिकी तंत्र के निर्माण के द्वारा विनिर्माण/ औद्योगिक क्षेत्र, विशेष रूप से एमएसएमई को भी बढ़ाएगी। इन उद्देश्यों

को प्राप्त करने के लिए आरएफपी में प्रमुख विशेषताएं- जैसे प्लेटफार्मों के स्वदेशी निर्माण का अनिवार्यता, पनडुब्बियों और कुछ महत्वपूर्ण उपकरण और सिस्टम के डिजाइन/ निर्माण/ रखरखाव के लिए टीओटी, अन्य प्रमुख प्रौद्योगिकियों आदि के लिए इस तरह के स्वदेशीकरण हेतु भारत में एक इको-सिस्टम की स्थापना तथा प्रोत्साहन हैं ।

इसका समग्र उद्देश्य सशस्त्र बलों की भविष्य की जरूरतों के लिए जटिल हथियार प्रणालियों के डिजाइन, विकास और निर्माण के लिए सार्वजनिक/ निजी क्षेत्र में स्वदेशी क्षमताओं का उत्तरोत्तर निर्माण करना होगा। यह व्यापक राष्ट्रीय उद्देश्यों को पूरा करने, आत्मनिर्भरता को प्रोत्साहित करने और रक्षा क्षेत्र को सरकार की 'मेक इन इंडिया' पहल के साथ जोड़ने की दिशा में एक महत्वपूर्ण कदम होगा।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1737303>



Press Information Bureau

Government of India

Ministry of Defence

Tue, 20 July 2021 2:20PM

Sarang to perform at Maks air show in Russia 20 July 2021

The Sarang Helicopter Display Team of the IAF is all set to perform for the first time at the MAKS International Air Show held at Zhukovsky International Airport, Russia. The air show is a biennial fixture and this year's edition is scheduled from 20 July 2021 to 25 July 2021.

This is the first occasion when the Sarang Team is performing its four helicopter aerobatics display in Russia, with its 'Made in India' 'Dhruv' Advanced Light Helicopters (ALH). These HAL manufactured machines have hinge less rotors and are equipped with state-of-the-art avionics, which makes them extremely suitable for military aviation. Apart from the IAF, the Indian Army, the Indian Navy and the Indian Coast Guard also operate this helicopter.



The Sarang Team was formed in 2003 at Bangalore and its first international display was at the Asian Aerospace Airshow at Singapore in 2004. Since then, Sarang has represented Indian aviation at air shows and ceremonial occasions in UAE, Germany, UK, Bahrain, Mauritius and Sri Lanka till date. Apart from aerobatics displays at national and international venues, the team has also taken active part in numerous Humanitarian Assistance and Disaster Relief Missions like Op Rahat in Uttarakhand (2013), Cyclone Ockhi in Kerala (2017) and Op Karuna flood relief in Kerala (2018).

<https://pib.gov.in/PressReleasePage.aspx?PRID=1737139>



पत्र सूचना कार्यालय
भारत सरकार
रक्षा मंत्रालय

Tue, 20 July 2021 2:20PM

सारंग 20 जुलाई 2021 से रूस में माक्स एयर शो में प्रदर्शन करेगी

भारतीय वायुसेना की सारंग हेलीकॉप्टर डिसप्ले टीम रूस के जुकोवस्की अंतर्राष्ट्रीय हवाई अड्डा में पहली बार माक्स अंतर्राष्ट्रीय एयर शो में प्रदर्शन करने के लिए पूरी तरह तैयार है। यह एयर शो एक द्विवार्षिक आयोजन है और इस वर्ष इसका आयोजन 20 जुलाई 2021 से 25 जुलाई 2021 तक किया जाएगा।



यह पहला अवसर है जब सारंग टीम अपने 'मेड इन इंडिया' 'ध्रुव' एडवांस्ड लाइट हेलीकॉप्टर (एएलएच) के साथ रूस में अपने चार हेलीकॉप्टर एरोबेटिक्स डिसप्ले करेगी। एचएएल निर्मित इन मशीनों में हिन्ज रहित रोटोर हैं और ये अत्याधुनिक एवियोनिक्स से सुसज्जित हैं जो उन्हें सैन्य उड्डयन के लिए बेहद अनुकूल बनाता है। भारतीय वायुसेना के अतिरिक्त, उन्हें सैन्य उड्डयन के लिए बेहद अनुकूल बनाता है। भारतीय वायुसेना के अतिरिक्त, भारतीय सेना, भारतीय नौसेना और भारतीय तटरक्षक भी इस हेलीकॉप्टर को ऑपरेट करते हैं।

सारंग टीम का निर्माण 2003 में बंगलुरु में हुआ था और इसका पहला अंतर्राष्ट्रीय डिसप्ले 2004 में सिंगापुर में एशियन एयरोस्पेस एयर शो में हुआ था। उसके बाद से सारंग ने अभी तक संयुक्त अरब अमीरात, जर्मनी, ब्रिटेन, बहरीन, मॉरीशस तथा श्रीलंका में एयर शो तथा औपचारिक अवसरों पर भारतीय उड्डयन का प्रतिनिधित्व किया है। राष्ट्रीय एवं अंतर्राष्ट्रीय स्थानों पर एरोबेटिक्स डिसप्ले के अतिरिक्त इस टीम ने उत्तराखंड में ऑपरेशन राहत (2013), केरल में ओखी तूफान (2017) तथा केरल में ऑपरेशन करुणा बाढ़ राहत (2018) जैसे अनगिनत मानवीय सहायता और आपदा राहत मिशनों में सक्रिय रूप से हिस्सा लिया है।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1737190>

Indian Navy Chief Karambir Singh to attend Russian Navy Day celebrations next week

The visit by the Indian Navy Chief to the country happens at a time when both countries are all set to host the maiden Foreign and Defence Ministers dialogue

By Siddhant Sibbal, Edited By Puskar Tiwari

New Delhi: Indian Navy Chief Admiral Karambir Singh will be visiting Russia next week for the Russian Navy Day celebrations. He is the 3rd high-level Indian official to visit Russia after External Affairs Minister Dr S Jaishankar and Foreign Secretary Harsh Shringla earlier this year.

Russia will hold the main day of the navy day in St Petersburg on July 25, which is a national holiday in Russia and is celebrated on the last Sunday of July.

The Indian Navy Ship (INS) Tabar will also be taking part in the celebrations of the Navy Day of Russia. The ship had sailed from India last month and will reach Russia, after exercising with navies of countries like Greece, France and Egypt.

Indian Navy chief has also travelled to Myanmar, Bangladesh and Australia in the past.

Navy chiefs of other countries like Iran's Navy Commander Admiral Hossein Khanzadi will also be present in the country for the Navy Day celebrations.

The visit by the Indian Navy Chief to the country happens at a time when both countries are all set to host the maiden Foreign and Defence ministers dialogue and annual India-Russia summit-level talks. Russian President Vladimir Putin is expected to travel to India contingent on the covid situation at that time.

<https://zeenews.india.com/india/indian-navy-chief-karambir-singh-to-attend-russian-navy-day-celebrations-next-week-2377490.html>



File photo: Indian Navy Chief Admiral Karambir Singh (L)

Ministry of Defence tenders for six more submarines at \$1 billion each

This six-submarine acquisition, codenamed Project 75(I), will be the first programme under the MoD's 'strategic partnership' model

By Ajai Shukla

New Delhi: Kick-starting one of the Indian Navy's most important weapon construction programmes, the Ministry of Defence (MoD) issued a tender on Tuesday for building six conventional submarines, at an Indian shipyard, in technology partnership with a chosen global original equipment manufacturer (OEM).

The MoD has pegged the cost of six submarines at about Rs 43,000 crore. This means that each boat (navies traditionally refer to submarines as "boats") will cost a staggering \$1 billion.

This six-submarine acquisition, codenamed Project-75(I), follows on from the on-going Project 75 – the construction of six conventional Scorpene boats by Mazagaon Dock Shipbuilders Limited (MDL), with technology supplied by Naval Group of France.

Three of the six Scorpene boats have already joined the navy's fleet. The remaining three are expected to join by 2023.

"Project-75(I) envisages indigenous construction of six modern conventional submarines... with contemporary equipment, weapons and sensors including fuel-cell based AIP (air independent propulsion plant), advanced torpedoes, modern missiles and state of the art countermeasure systems," stated an MoD press release on Tuesday.

Project 75-I will be the first acquisition programme under the MoD's "strategic partnership (SP) model." That involves selecting an Indian firm as the SP to oversee and control the project. Two SPs have been shortlisted already: MDL and Larsen & Toubro (L&T).

The shortlisted SPs are required to submit proposals for building the six submarines in partnership with any of five foreign OEMs the MoD has shortlisted.

The shortlist is: Naval Group from France, Thyssenkrupp Marine Systems (TKMS) from Germany, Russian export agency Rosoboronexport, Daewoo Shipbuilding and Marine Engineering (DSME) from South Korea and Spanish shipyard, Navantia.

"These five foreign firms are the world leaders in the field of conventional submarine design, construction and all other related technologies... Foreign OEMs will enable SP for construction of submarines, achieving high levels of indigenization, and transfer of technology (ToT). These OEMs would enable setting up of dedicated manufacturing lines for these submarines in India by providing ToT for submarine design and other technologies and make India the global hub for submarine design and production," stated the MoD.

The most complex technological challenge in Project 75 (I) is the integration of AIP systems into the six submarines. An AIP system increases the boats' underwater endurance and therefore its survivability.

Diesel-electric submarines, such as India's Kilo-class and Scorpene, are powered by enormous banks of electric batteries, which drive electric motors that turn the submarine's propellers. Since batteries get discharged quickly, the submarine must surface every day or two to recharge them by



Each submarine, equipped with (fuel cell) air-independent propulsion, to cost \$1 billion

running diesel generators (which require atmospheric air). However, surfaced submarines are visible to radar and, therefore, vulnerable to attack.

Nuclear boats bypass this vulnerability, since they can remain submerged almost indefinitely. However, designing a small nuclear reactor poses major technology challenges. The navy is processing a Rs 90,000 crore project to build six 6,000-tonne, nuclear-powered, attack submarines. However, that could be a decade in the making.

Until these nuclear boats are commissioned, AIP provides an interim solution. Since they do not have conventional batteries that require generator charging, boats with AIP can remain submerged for 10-14 days, reducing vulnerability.

The AIP “fuel cell technology” that the MoD has specified generate power through the reverse electrolysis of oxygen and hydrogen, which are carried on board the submarine. This charges the submarine’s batteries, doing away with the need for a diesel generator.

Citing the stated aims of the SP model, the MoD said: “The project (75-I) would not only aid in boosting (India’s) core submarine/ship building industry but would also greatly enhance manufacturing/industrial sector, especially the MSMEs (micro, small and medium enterprises) by development of an industrial eco-system for manufacture of associated spares/systems /equipment related to submarines.”

“In order to achieve these objectives, the request for proposals (RFP) has key features like mandatory level of indigenous manufacture of platforms, ToT for design/ manufacture/ maintenance of submarines and a few critical equipment and systems, setting up of an eco-system in India for such indigenisation and incentivisation for other key technologies, etc,” it said.

“The overall aim would be to progressively build indigenous capabilities in the public/private sector to design, develop and manufacture complex weapon systems for the future needs of the Armed Forces,” said the MoD.

The SP model, which is detailed in the Defence Acquisition Policy of 2020 (DAP 2020), is intended to provide a leading role to private Indian firms in building four categories of defence equipment: Submarines, fighter aircraft, helicopters and armoured vehicles.

However, there is resentment amongst private shipyards at the inclusion of defence public sector firm, MDL, in the shortlist for Project 75-I.

https://www.business-standard.com/article/economy-policy/ministry-of-defence-tenders-for-six-more-submarines-at-1-billion-each-121072001711_1.html

LoC, cameras, action — how hi-tech equipment is helping Indian Army guard the border better

Emergency financial powers besides existing special financial powers have helped the Army make technological upgrades to infantry soldiers along the LoC and LAC

By Snehesh Alex Philip, Edited by Poulomi Banerjee

Poonch/Bhimber Gali: Over the past few years, India's frontline soldiers have witnessed a slow but massive technology transformation, not just in terms of weapons, lighter bulletproof jackets, ballistic helmets but also in getting situational awareness of their area of operations.

Be it along the Line of Control (LoC) with Pakistan or the Line of Actual Control (LAC) with China, the average infantry soldier is better equipped, something which was earlier unique to the Special Forces.

ThePrint, which was on a visit to the LoC recently, witnessed new systems that have been deployed, which makes the soldier more aware of his surroundings, besides getting new protective and firing gears.

“The regular infantry soldier along the LoC has indeed seen a massive transformation. He is better equipped, has lighter gear to carry, and is more aware of his area of operations,” a source in the defence establishment said.



Soldiers carrying out a patrolling drill at the LoC | Snehesh Alex Philip | ThePrint

Sources point out that the biggest reason behind this technological upgrade is the emergency financial powers that have been delegated to Army Headquarters for procurement of equipment besides the already existing Army Commanders' Special Financial Powers (ACSFP).

The emergency procurement powers were given to the Services immediately after the 2016 surgical strikes and also after the Balakot strikes and during the ongoing standoff with China along the LAC.

Amid all the seven Commands, the Northern Command gets the biggest chunk, both in terms of emergency procurement and also the ACSFP.

What will pave the way for further faster procurement of Command specific items is the decision of the Narendra Modi government in March this year to delegate financial powers under capital procurement to Command heads of Army, the Air Force, and the Navy to make expenses to the tune of Rs 100 crore at their own discretion.

Better equipped soldiers

One of the biggest changes that the frontline infantry soldier has seen is in the area of firepower.

The soldiers have now got more lethal firepower in the form of the SiG 716 rifle that was bought from the US under the emergency procurement clause.

“The rifle has a better range, accuracy, and lethality than the AK-47s. It is way better than the INSAS,” a source said.

Another big change has been the bulletproof jackets. The soldier now wears a much lighter jacket, weighing about 3.3 kg, which makes mobility easier.

Since the terrain in which the soldiers operate in are slippery and mountainous, they have also been given protective pads which will bear the impact of any fall and also help in crawling when needed.

These particular items were in limited numbers earlier, but now most of the soldiers have them. The troops now also have ballistic helmets which give their heads all-around protection, unlike in the earlier ones.

The Northern Command has also gone in for procurement, though in limited numbers, of the US-made Exfil ballistic helmets, regarded as the finest in the world.

These helmets were first procured by the Special Forces of the Army, but are now available for selected groups of regular infantry soldiers.

These helmets can also be fixed with a night vision camera and the idea is to have all soldiers who are out for operations along the LoC to have individual secured communication sets.

Investment in cameras and drones

The Army has not just focused on equipping the soldiers with arms and lighter load, but also on giving better situational awareness.

“All these are geared to help him fight the enemy in a much better way,” a second source said.

The biggest addition has been the use of tactical drones. These drones are of different make and can easily be operated by a soldier to carry out surveillance of the area around him.

Along with this, another big factor has been the investment in hi-tech cameras in multiple locations along the LoC.

These cameras have night vision as well as infra-red capabilities and are basically meant to spot infiltrators.

“We have been using cameras for a long time but we now have a wider coverage. The next step is to have artificial intelligence-enabled cameras that will be able to send an alarm back as soon as it detects infiltration,” a third source said.

Some of the more specialised, indigenously-built cameras, installed at various Army posts along the LoC, have the capability of longer zooms and can pick up movements happening in Pakistani positions.

Asked if Pakistan has such cameras, a source quoted above said, “Pakistanis also have cameras, but in limited supply. What works to our advantage is that our products are indigenous and have high range and clarity”.

Such is the capability of the integrated cameras being used that somebody sitting at the Army headquarters in Delhi can watch the live feed from the LoC.

<https://theprint.in/defence/loc-cameras-action-how-hi-tech-equipment-is-helping-indian-army-guard-the-border-better/699602/>

Russia hands over commercial offer of 21 MiG-29 fighter jets to India

Last year, the Defence Ministry gave its approval to the Indian Air Force to speedily procure 21 MiG-29 fighter jets besides 12 Sukhoi MK1 from Russia

Russia will be supplying 21 MiG-29 fighters to India, a spokesperson for Russia's Federal Service for Military-Technical Cooperation said.

"The Indian Air Force staff received a tender request for the supply of 21 aircraft in 2021. The Russian side has transferred to Indian partners the commercial offer that is now being considered by the customer," Sputnik quoted spokesperson Valeria Reshetnikova as saying on the sidelines of the MAKS-2021 international aerospace show.

Last year, the Defence Ministry gave its approval to the Indian Air Force to speedily procure 21 MiG-29 fighter jets besides 12 Sukhoi MK1 from Russia.

The Indian Air Force (IAF) had pushed a proposal to the government for acquiring new fighter aircraft, including 21 MiG-29s from Russia in June last year, as per the ANI news agency.

The 21 MiG 29s that the IAF is planning to acquire are from Russia and meet its requirement of new fighters. The IAF has carried out a study to check the airframe of the MiG-29s.

The Air Force has three squadrons of the MiG-29s -- a twin-engine single-seat air superiority fighter aircraft -- which have been undergoing upgrades for extended life and are considered reliable in the air defence roles.

<https://www.livemint.com/news/india/russia-hands-over-commercial-offer-of-21-mig-29-fighter-jets-to-india-11626828760548.html>



File photo of the Indian Air Force MiG-29 fighter aircraft.



Press Information Bureau
Government of India

Ministry of Science & Technology

Tue, 20 July 2021 4:55PM

New low cost electrical contact material for thermoelectric devices

- *Stable at high temperature*
- *Thermostatic material can generate electricity by using temperature difference between its two sides*
- *Device can also function as a small heat pump*

Researchers have developed a new low-cost electrical contact material for thermoelectric devices that is stable at high temperature. The thermoelectric material can generate electricity by using a temperature difference between its two sides. The thermoelectric device can also function as a small heat pump, moving heat from one side of the device to the other.

Thermoelectric materials convert thermal energy directly into electricity through a process that involves a solid-state electron and phonon diffusion process. Though the principle is known for two centuries, it had limited utility as most known thermoelectric materials' energy conversion efficiency is very low. Nanotechnology brought innovations to improve the efficiency of materials, but the mass-market application of such innovations has remained restricted due to the low device conversion efficiency of 6-10%. This makes the electricity produced costlier than other technologies.

Researchers from the International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI), an autonomous institute of the Department of Science & Technology, have designed and developed thermoelectric modules using lead telluride (PbTe) and magnesium stannite silicide ($Mg_2Si_{1-x}Sn_x$) compounds, which gives more than 10% conversion efficiency. This work has been published in the journal 'Materials Research Bulletin' recently.

The thermoelectric device, which requires a metal electrode electrically connected to semiconductor thermoelectric materials, needs two essential functional requirements. The joint should be stable at elevated operating temperature (300-600°C) and should not undergo any thermochemical degradation. It should have the least contact resistance so that the current flow and the power delivered reach a maximum.

The ARCI team explored various metallization methods and diffusion barrier materials with a systemic approach to make a stable bismuth-doped $Mg_2(Si_{1-x}Sn_x)$ -Cu joint to fabricate a thermoelectric generator. A single-step direct vacuum hot pressing of bismuth-doped magnesium

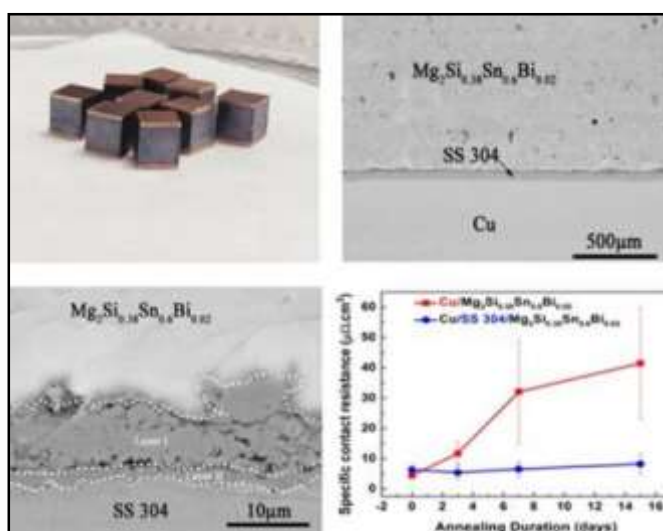


Figure 1 shows the TE legs, SEM micrograph, and the variation of contact resistance with annealing of the $Mg_2(Si_{0.38}Sn_{0.6})Bi_{0.02}$ -Cu joint with SS 304 barrier layer.

silicide stannide ($Mg_2(Si_{0.38}Sn_{0.6})Bi_{0.02}$) powder produced a dense pellet with a mechanically stable metalized layer suitable to use in thermoelectric modules up to 400°C.

The bismuth-doped magnesium silicide stannide powder synthesized by induction melting of constituent elements and ball milling of the solidified ingots was hot-pressed with SS304 and copper (Cu) powders. The joint's specific contact resistance is around $4.4 \mu\Omega.cm^2$, which is the lowest value reported so far in this material.

The joint showed excellent thermal stability up to 450°C temperature when tested for 15 days, with insignificant change in the reaction layers thickness at the interface. By using these joints, a thermoelectric device has been developed successfully and tested for its performance.

Figure 1 SEM micrograph of $Mg_2(Si_{0.38}Sn_{0.6})Bi_{0.02}$ -Cu joint with SS 304 diffusion barrier layer (left) and the variation of specific contact resistance with annealing time at 450°C. The interfaces are free from mechanical defects showing perfect diffusion bonding of Cu with SS304. At the SS304/ $Mg_2Si_{0.38}Sn_{0.6}Bi_{0.02}$ interface, a continuous reaction layer with two sublayers was developed. The combined thickness of the reaction layers varied from 12 to 30 μm . The good bonding between the $Mg_2(Si_{0.38}Sn_{0.6})Bi_{0.02}$ and SS 304 due to these reaction layers makes the hot-pressed pellets suitable for mechanically dicing up to 3 mm x 3mm cross-section legs usually used in TE modules. Thus the research demonstrated a single-step, low-cost process to fabricate a reliable metal-thermoelectric joint with less than $5 \mu\Omega.cm^2$ contact resistance to fabricate TEG.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1737229>



पत्र सूचना कार्यालय
भारत सरकार

विज्ञान एवं प्रौद्योगिकी मंत्रालय

Tue, 20 July 2021 4:55PM

थर्मोइलेक्ट्रिक डिवाइसों के लिए नया किफायती इलेक्ट्रिकल कॉन्टैक्ट मैटेरियल

- ऊंचे तापमान पर स्थिर
- थर्मोस्टैटिक मैटेरियल अपनी दो सतहों के बीच तापमान के अंतर के उपयोग के द्वारा बिजली पैदा कर सकता है
- डिवाइस एक छोटे हीट पम्प के रूप में भी काम कर सकता है

शोधकर्ताओं ने थर्मोइलेक्ट्रिक डिवाइस के लिए एक नया किफायती इलेक्ट्रिकल कॉन्टैक्ट मैटेरियल विकसित किया है, जो ऊंचे तापमान पर स्थिर रहता है। थर्मोइलेक्ट्रिक मैटेरियल अपनी दोनों सतहों के तापमान के अंतर के उपयोग के द्वारा बिजली पैदा कर सकता है। थर्मोइलेक्ट्रिक डिवाइस एक छोटे हीट पम्प के रूप में भी काम कर सकती है, जिसमें ऊष्मा एक तरफ से दूसरी तरफ गति करती है।

थर्मोइलेक्ट्रिक मैटेरियल तापीय ऊर्जा को एक प्रक्रिया के माध्यम से सीधे बिजली में तब्दील कर देता है, जिसमें एक ठोस अवस्था में इलेक्ट्रॉन और फोनन के प्रसार की प्रक्रिया शामिल होती है। भले ही इस सिद्धांत को दो सदियों से जाना जाता है, लेकिन इसकी सीमित उपयोगिता रही है क्योंकि सबसे ज्ञात थर्मोइलेक्ट्रिक मैटेरियल्स की ऊर्जा रूपांतरण की क्षमता काफी कम है। नैनो टेक्नोलॉजी ने मैटेरियल्स की दक्षता में सुधार के लिए कई नवाचार पेश किए, लेकिन 6-10 प्रतिशत की कम डिवाइस रूपांतरण दक्षता के

कारण ऐसे नवाचारों का बाजार में व्यापक उपयोग नहीं हुआ है। इस प्रकार, इससे पैदा बिजली अन्य तकनीकों की तुलना में महंगी पड़ती है।

विज्ञान एवं प्रौद्योगिकी विभाग के स्वायत्त संस्थान इंटरनेशन एडवांस्ड रिसर्च सेंटर फॉर पाउडर मेटलर्जी एंड न्यू मैटेरियल्स (एआरसीआई) के शोधकर्ताओं ने लेड टेलुराइड (पीबीटीई) और मैग्नीशियम स्टैनाइट सिलिसाइड ($Mg_2Si_{1-x}Sn_x$) कम्पाउंड्स का इस्तेमाल करते हुए थर्मोइलेक्ट्रिक मॉड्यूल डिजाइन विकसित किया है, जो 10 प्रतिशत से ज्यादा रूपांतरण दक्षता देता है। इस कार्य को हाल में पत्रिका 'मैटेरियल्स रिसर्च बुलेटिन' में प्रकाशित किया गया है।

थर्मोइलेक्ट्रिक डिवाइस, जिसके लिए एक धातु के इलेक्ट्रोड को विद्युत द्वारा सेमीकंडक्टर थर्मोइलेक्ट्रिक मैटेरियल्स जोड़ने की जरूरत होती है, के लिए दो आवश्यक कार्यात्मक जरूरतें होती हैं। यह जोड़ ऊंचे परिचालन तापमान (300-600 डिग्री) पर स्थिर रहना चाहिए और इसे किसी थर्मोकैमिकल डिग्रेडेशन से नहीं गुजारा जाना चाहिए। इसमें कम से कम संपर्क प्रतिरोध होना चाहिए, जिससे करंट का प्रवाह और बिजली की आपूर्ति अधिकतम स्तर तक पहुंच जाए।

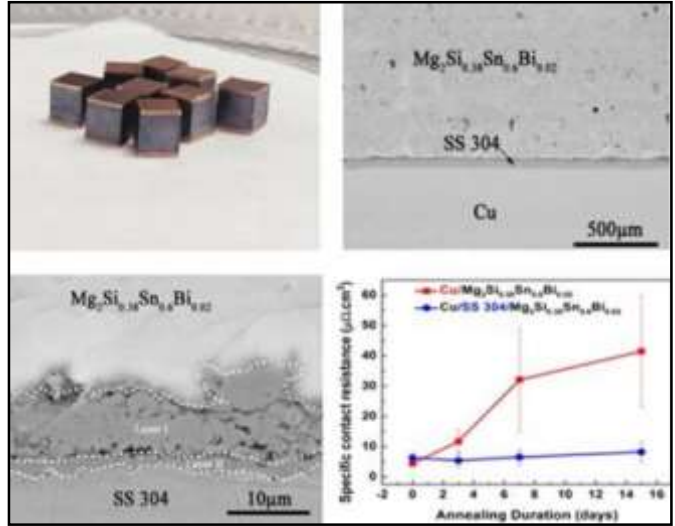
एआरसीआई दल ने एक थर्मोइलेक्ट्रिक जनरेटर बनाने के उद्देश्य से एक स्थिर बिस्मथ-डोपड $Mg_2(Si_{1-x}Sn_x)-Cu$ जोड़ बनाने के एक

व्यवस्थित दृष्टिकोण के साथ विभिन्न मेटलाइजेशन विधियों और डिफ्यूजन बैरियर मैटेरियल्स की खोज की थी। बिस्मथ-डोपड मैग्नीशियम सिलिसाइड स्टैनाइट ($Mg_2(Si_{0.38}Sn_{0.6})Bi_{0.02}$) पाउडर की एक सिंगल-स्टेप हॉट प्रेसिंग से एक यांत्रिक रूप से स्थिर मेटलाइज्ड परत के साथ एक सघन पेलेट तैयार होती है, जो 400 डिग्री सी तक थर्मोइलेक्ट्रिक मॉड्यूल्स में इस्तेमाल के लिए उपयुक्त होती है।

घटक तत्वों की इंडक्शन मेल्टिंग और ठोस सिल्लियों की बॉल मिलिंग के द्वारा संश्लेषित बिस्मथ-डोपड मैग्नीशियम सिलिसाइड स्टैनाइट पाउडर को एसएस304 और कॉपर (सीयू) पाउडरों के साथ हॉट प्रेस किया जाता है। जोड़ का विशिष्ट संपर्क प्रतिरोध लगभग $4.4 \mu\Omega$ वर्ग सेंटीमीटर है, जो अभी तक इस मैटेरियल के लिए सबसे कम है।

जोड़ का जब 15 दिन के लिए परीक्षण किया गया तो इंटरफेस पर रिएक्शन लेयर्स की मोटाई में नगण्य परिवर्तन के साथ उसने 450 डिग्री तापमान तक उत्कृष्ट तापीय स्थिरता प्रदर्शित की। इन जोड़ों के इस्तेमाल के द्वारा, एक थर्मोइलेक्ट्रिक डिवाइस सफलतापूर्वक विकसित की गई है और इसके प्रदर्शन का परीक्षण किया गया है।

चित्र 1 एसएस 304 डिफ्यूजन बैरियर लेयर (बायें) के साथ $Mg_2(Si_{0.38}Sn_{0.6})Bi_{0.02}-Cu$ जोड़ का एसईएम माइक्रोग्राफ और 450 डिग्री सेल्सियस पर गर्म कर धीरे धीरे ठंडा करन के समय के साथ विशेष संपर्क प्रतिरोध में बदलाव दिखाता है। इंटरफेसेस के यांत्रिक खामियों से मुक्त होने से एसएस304 के साथ सीयू का उचित प्रसार संबंध जाहिर होता है। SS304/ $Mg_2Si_{0.38}Sn_{0.6}Bi_{0.02}$ इंटरफेस पर दो उप परतों के साथ एक निरंतर प्रतिक्रिया परत विकसित की गई थी। प्रतिक्रिया परतों के कुल मोटाई 12 से 30 μm के बीच रही। इन प्रतिक्रिया परतों के कारण $Mg_2(Si_{0.38}Sn_{0.6})Bi_{0.02}$ और एसएस304 के बीच अच्छी बॉन्डिंग



चित्र 1 टीई लेग्स, एसईएम माइक्रोग्राफ और एसएस 304 बैरियर लेयर के साथ $Mg_2(Si_{0.38}Sn_{0.6})Bi_{0.02}-Cu$ जोड़ की एनीलिंग के साथ संपर्क प्रतिरोध की भिन्नता दिखाता है।

से आम तौर पर टीई मॉड्यूलस में उपयोग होने वाली 3 एमए x 3 एमए क्रॉस-सेक्शन लेग्स तक यांत्रिक रूप से डाइसिंग के ए उपयुक्त हॉट-प्रेसड पेलेट्स बनती हैं। इस प्रकार, शोध से टीईजी तैयार करने के लिए 5 $\mu\Omega$. वर्ग सेंटीमीटर से कम के संपर्क प्रतिरोध के साथ एक विश्वसनीय मेटल-थर्मोइलेक्ट्रिक जोड़ बनाने के लिए एक सिंगल-स्टेप, किफायती प्रक्रिया सामने आती है।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1737334>

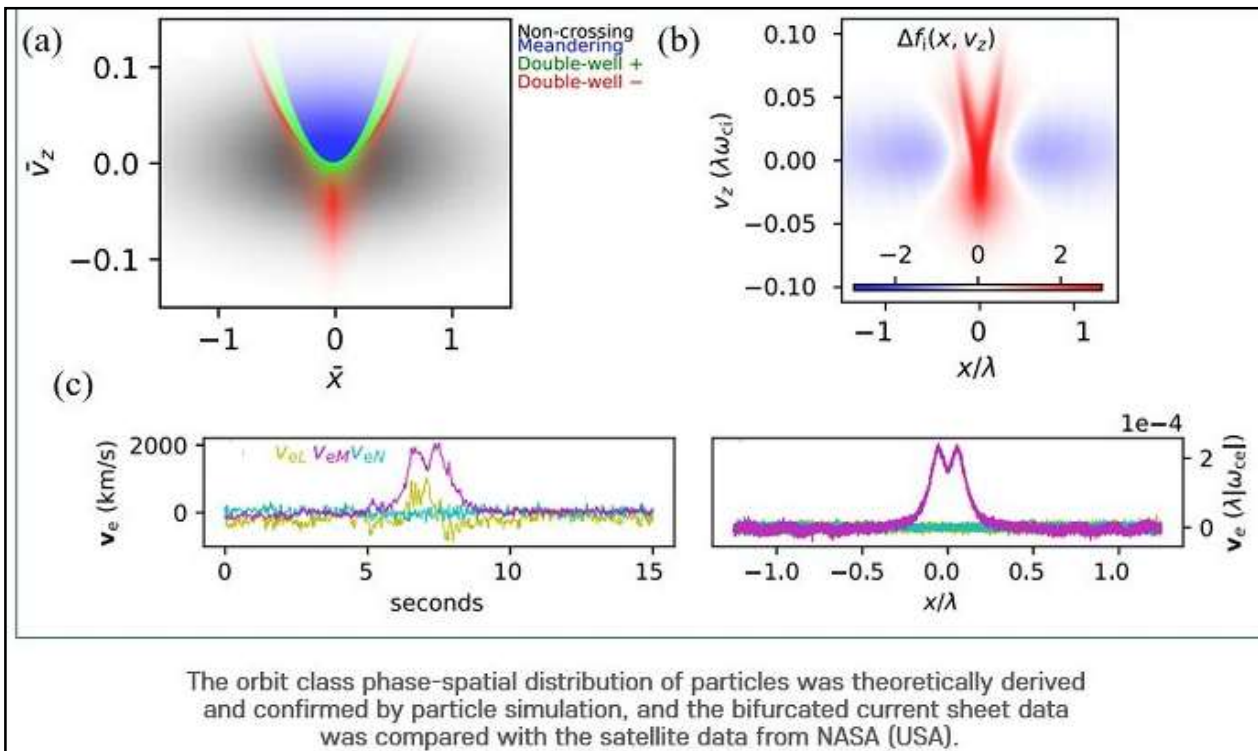


Wed, 21 July 2021

The origin of bifurcated current sheets explained

A Korean research team has identified the origin of bifurcated current sheets, considered one of the most unsolved mysteries in the Earth's magnetosphere and in magnetized plasma physics.

A POSTECH joint research team led by Professor Gunsu S. Yun of the Department of Physics and Division of Advanced Nuclear Engineering and Dr. Young Dae Yoon from the Pohang Accelerator Laboratory has theoretically established the process of collisionless equilibration of disequibrated plasma current sheets. In addition, by comparing this with particle simulations and satellite data from NASA, the origin of the bifurcated current sheets—which had remained largely unknown—has been revealed.



Credit: Pohang University of Science & Technology (POSTECH)

In the Earth's magnetosphere, a sheet-shaped plasma is observed that is trapped between two regions of opposing magnetic fields. Because current flows inside it, it is also called a current sheet. According to the conventional theory, the current sheet exists as a single bulk in which the magnetic pressure due to the magnetic field generated by the current and the thermal pressure of the plasma balance one another, thereby forming an equilibrium. However, in 2003, the European Space Agency's Cluster mission observed a bifurcated current sheet in Earth's magnetosphere. Since then, similar phenomena have been observed.

On the other hand, extensive research has been accumulated on the condition in which the magnetic force and thermal pressure are perfectly balanced with each other in the current sheet. But the process through which a disequibrated current sheet equilibrates remains largely unknown. Since plasma systems generally do not start from an equilibrium state, comprehension of the equilibration process is desired to better understand the current sheet plasma dynamics.

The joint research team thoroughly analyzed the process in which the disequibrated sheet achieves equilibrium by considering the orbit classes and phase-space distributions of particles that constitute the current sheet and found that the current sheets can naturally bifurcate during the equilibration process. It was then confirmed that these theoretical predictions were consistent with the particle-in-cell simulation results performed by the KAIROS supercomputer at the Korea Institute of Fusion Energy. In addition, the simulation data were compared and verified with NASA's Magnetospheric Multiscale (MMS) measurements.

This achievement has enhanced the comprehension of magnetized plasma dynamics by incorporating theoretical analyses, supercomputer simulations, and satellite observations. Since the Earth's magnetospheric plasma has similar characteristics as other magnetized plasmas such as nuclear fusion plasmas in various ways, it is anticipated to contribute to a wide range of fields.

"This study has a significant academic value in that it simultaneously resolved two mysteries: the process through which disequibrated current sheet equilibrates and the origin of bifurcated current sheets," explained Professor Gunsu S. Yun of POSTECH who participated as a co-corresponding author in the study. "We are trying to extend the analysis framework for plasmas with strong guide fields and hope to understand similar phenomena that occur in fusion plasmas."

More information: Young Dae Yoon et al, Collisionless relaxation of a disequibrated current sheet and implications for bifurcated structures, *Nature Communications* (2021). [DOI: 10.1038/s41467-021-24006-x](https://doi.org/10.1038/s41467-021-24006-x)

Journal information: [Nature Communications](https://phys.org/news/2021-07-bifurcated-current-sheets.html)
<https://phys.org/news/2021-07-bifurcated-current-sheets.html>

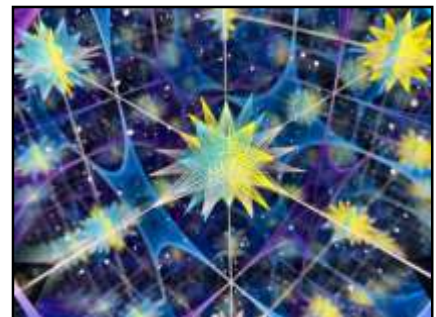


Wed, 21 July 2021

Anomalous quantum transport phenomena observed in fractal photonic lattices

By Xiao-Yun Xu

Fractals are complex structures that usually exhibit self-similarity and have a non-integer dimension. The terminology "fractal" was first introduced by the famous mathematician Benoit B. Mandelbrot. He noticed that here and there, many natural objects were fractals, such as snowflakes, branching trees, coastline, etc. Outside of nature, fractal patterns or structures are also artificially created. One famous fractal type, Sierpinski gaskets, are widely used not only in the decoration of churches in ancient times, but also in modern artificial device engineering. So far, the feature of fractality has been reported in a wide range of fields including quantum mechanics, optics, finance, physiology, etc.



Credit: [Unsplash/CC0 Public Domain](#)

The aesthetic appeal of the appearance of fractals derives from the property of self-similarity. Physicists are also interested in the subtle physical law embedded in these unconventional systems, which are non-integer dimensional. Euclidean geometry is of integer dimension, and physical laws are mostly introduced in the case of integer-dimensional space. However, anomalous phenomena might occur in a different situation. Though there have been abundant theoretical and numerical

studies in recent decades, experimental investigations of quantum transport in fractal space remain elusive.

Recently, a research group led by Prof. Xian-Min Jin from Shanghai Jiao Tong University, in collaboration with Prof. C. Morais Smith from Utrecht University, have experimentally investigated quantum transport dynamics in fractal space and observed anomalous phenomena. By using femtosecond laser direct writing techniques, the researchers were able to fabricate photonic lattices whose profile is fractal. Three typical types of fractals, Sierpinski gaskets, Sierpinski carpets and dual Sierpinski carpets, were precisely mapped to the photonic lattices. They are different either in Hausdorff dimension (i.e., the fractal dimension) or in geometry. Although dual Sierpinski carpets inherit the Hausdorff dimension of Sierpinski carpets, they have completely different geometry. The differences among the three fractals enable the researchers to investigate the interplay between quantum transport and fractality.

In the research, quantum walk, the quantum analog to the classical random walk, was used as a model to investigate quantum transport. Photons were launched into the photonic lattices to perform continuous-time quantum walks. The length of the lattices determines the evolution time of photons. By writing photonic lattices with incremental length, the researchers managed to capture the evolution results of photons at different moments and thus unveiled the quantum transport dynamics. The mean square displacement (MSD) was applied to characterize the quantum transport dynamics.

The results show that the transport dynamics can hardly be described by a single regime. It usually undergoes several stages, such as the normal regime, the fractal regime and the final saturation, which is different from the regular case. It is worth stressing that in contrast to translational-invariant lattices where the MSD scales quadratically, the MSD (in the fractal regime) is solely determined by the Hausdorff dimension. This anomalous phenomenon coincides well with the theoretical proposal of Fleischmann et al. The researchers have also further confirmed the robustness of the proposed relation by performing their simulation in a considerable large fractional space, and by investigating the independence of the relation on the input site (i.e., the position where the photons are launched into the lattices).

The research paves the way to a deeper understanding of physical law in fractional space. In addition to the fundamental interest in physics, it might shed some light on whether quantum mechanics plays any role in the transport in biological systems such as fractal-like brain hierarchy and branching trees where energy transport or information transport happens all the time. From the aspect of quantum algorithm, the realization of fractal photonic lattices lays a foundation for the experimental exploration of quantum spatial search based on continuous-time quantum walk.

More information: Mandelbrot, B. B. *Fractals: Form, Chance and Dimension* (W. H. Freeman, 1977)

Mandelbrot, B. B. *The Fractal Geometry of Nature* (W. H. Freeman, 1983)

Xu, X.-Y. et. al. Quantum transport in fractal network. *Nat. Photon.* (2021). [DOI: 10.1038/s41566-021-00845-4](https://doi.org/10.1038/s41566-021-00845-4)

Fleischmann, R., Geisel, T., Ketzmerick, R. & Petschel, G. Quantum diffusion, fractal spectra, and chaos in semiconductor microstructures. *Physica D* 86, 171–181 (1995)

<https://phys.org/news/2021-07-anomalous-quantum-phenomena-fractal-photonic.html>

Scientists shuffle atomic layers like playing cards to make new quantum materials

Materials scientists can now shuffle layered compounds together, much like combining two different decks of cards. The technique, recently discovered by a team of researchers at the U.S. Department of Energy's Ames Laboratory, is leading to development of new materials with unusual electron transport properties that have potential applications in next-generation quantum technologies.

The discovered technique has shown another unexpected and promising application in new materials design. The "reshuffling" approach can generate thermally stable three-dimensional (3D) heterostructures from layered transition metal dichalcogenides (TMDCs). These are van der Waals materials composed of metal nanolayers sandwiched between two other layers of chalcogens—sulfur, selenium, or tellurium. Similar to graphite, these compounds can be exfoliated into 2D layers, which display unique electron transport properties and quantum phenomena.

"TMDCs are very intriguing to researchers as a possibility for applications in renewable energy, catalysis and optoelectronics, to name only a few," said project leader Viktor Balema, a Senior Scientist in the Divisions of Materials Sciences and Engineering at Ames Laboratory. "Our goal in research has been the development of such re-assembly methods for these layered materials, which are not only efficient, but also scalable and cost effective in production."

Researchers at Ames Laboratory have been successful in overcoming one of the major challenges of composing these layered materials—the difficulty of sandwiching together atomically dissimilar, incommensurate, materials—through the use of mechanochemistry that is facilitated by ball milling.

"Now, we have demonstrated that we can mechanochemically design novel layered heterostructures, control their composition and tune their properties," said Ihor Hlova, a scientist in the Divisions of Materials Sciences and Engineering at Ames Laboratory. "This opens a way to a variety of different combinations—the possibilities are basically unlimited."

So far, this approach has proven to work on several very different groups of compounds and continues to surprise the scientists with new discoveries. The materials prepared using the team's "layers-reshuffling" technique have already shown broad range of electron transport properties ranging from semi-conductivity to metallic conductivity, depending on the building blocks involved.

The research is further discussed in the paper "Incommensurate transition-metal dichalcogenides via mechanochemical reshuffling of binary precursors," published in *Nanoscale Advances*.

More information: Ihor Z. Hlova et al, Incommensurate transition-metal dichalcogenides via mechanochemical reshuffling of binary precursors, *Nanoscale Advances* (2021). DOI: [10.1039/D1NA00064K](https://doi.org/10.1039/D1NA00064K)

<https://phys.org/news/2021-07-scientists-shuffle-atomic-layers-cards.html>



Credit: *Nanoscale Advances*

COVID-19 Research News



Press Information Bureau
Government of India

Ministry of Education

Tue, 20 July 2021 11:48AM

IIT Ropar develops first-of-its-kind Oxygen rationing device - AMLEX

To increase the life of medical oxygen cylinders three fold, the Indian Institute of Technology, Ropar has developed a first-of-its-kind Oxygen Rationing Device – AMLEX that supplies a required volume of oxygen to the patient during inhalation and trips when the patient exhales CO₂. This process saves oxygen which otherwise unnecessarily get wasted.

So far, during exhalation, the oxygen in the oxygen cylinder/pipe is pushed out along with the exhaled CO₂ by the user. This leads to wastage of a large volume of oxygen in long run. In addition to this, a large volume of oxygen escapes from the openings of the mask to the environment in the resting period (between inhalation and exhalation) due to continuous flow of life saving gas in the mask. As we have seen the demand of medical oxygen has jumped manifold amid the second wave of Covid-19, the device would help in stopping the unwanted wastage of the same.



“The device can operate on both portable power supply (battery) as well as line supply (220V-50Hz)”, said Director, IIT, Ropar, Prof. Rajeev Ahuja.

It has been developed by PhD students of Biomedical Engineering Department of the institution - Mohit Kumar, Ravinder Kumar and Amanpreet Chander under the guidance of Dr. Ashish Sahani, Assistant Professor, Department of Biomedical Engineering.

“Made specifically for oxygen cylinders, AMLEX can be easily connected between oxygen supply line and the mask worn by the patient. It uses a sensor which senses and successfully detects inhalation and exhalation of the user in any environmental condition”, said Dr Sahani. This ready to use device works with any commercially available oxygen therapy masks having multiple openings for air flow.

Appreciating the innovation, Dr GS Wander, Director, Research and Development at Dayanand Medical College, Ludhiana, said that in the present pandemic times we all have learnt the importance of effective and pertinent use of life saving Oxygen. He said though many hospitals are increasing their oxygen production capacity, a device like this can really help in limiting the use of oxygen in small rural and semi urban health centers.

Prof. Rajeev Ahuja said that the country now needs rapid but safe solutions to combat Covid-19. Since the virus is affecting the lungs and subsequently breathing system of the patient, the institution has not intended to go in for patenting of the device. He said rather the IIT would be happy to transfer this technology free of cost, in the interest of the nation, to those interested to go in for mass production of the device.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1737098>



Tue, 20 July 2021 11:48AM

आईआईटी, रोपड़ ने अपनी तरह की पहली ऑक्सीजन राशनिंग डिवाइस-एमलेक्स विकसित की

मेडिकल ऑक्सीजन सिलेंडरों के जीवनकाल में तीन गुना बढ़ोत्तरी करने के लिए भारतीय प्रौद्योगिकी संस्थान, रोपड़ ने अपनी तरह की पहली ऑक्सीजन राशनिंग डिवाइस-एमलेक्स विकसित की है जो सांस लेने तथा रोगी द्वारा कार्बन डाइऑक्साइड छोड़ने के दौरान रोगी को ऑक्सीजन की आवश्यक मात्रा की आपूर्ति करती है। यह प्रक्रिया ऑक्सीजन की बचत करती है जो वैसे अनावश्यक रूप से बर्बाद हो जाती है।

अभी तक, सांस छोड़ने के दौरान ऑक्सीजन सिलेंडर/पाइप में रहा ऑक्सीजन भी उपयोगकर्ता द्वारा कार्बन डाइऑक्साइड छोड़े जाते समय बाहर निकल जाती है। इससे दीर्घ अवधि में बड़ी मात्रा में ऑक्सीजन का अपव्यय होता है। इसके अतिरिक्त, मास्क में जीवन रक्षक गैस के निरंतर प्रवाह के कारण रेस्टिंग पीरियड (सांस लेने और छोड़ने के बीच) में मास्क की ओपनिंग्स से बड़ी मात्रा में ऑक्सीजन वातावरण में चली जाती है। जैसा कि हमने देखा है कि कोविड-19 की दूसरी लहर के दौरान मेडिकल ऑक्सीजन की मांग में कई गुना बढ़ोत्तरी हुई है, यह डिवाइस ऑक्सीजन की अवांछित बर्बादी को रोकने में सहायता करेगी।

आईआईटी, रोपड़ के निदेशक प्रोफेसर राजीव आहुजा ने कहा "यह डिवाइस पोर्टेबल पावर सप्लाई (बैट्री) तथा लाइन सप्लाई (220 वाट-50 हर्ट्ज) दोनों पर ऑपरेट कर सकती है।" इसे संस्थान के बायोमेडिकल इंजीनियरिंग विभाग के पीएचडी छात्रों- मोहित कुमार, रविंदर कुमार और अमनप्रीत चंद्र ने बायोमेडिकल इंजीनियरिंग विभाग के असिस्टेंट प्रोफेसर डॉक्टर आशीष साहनी के दिशानिर्देश में विकसित किया है।

डॉ. साहनी ने कहा "विशेष रूप से ऑक्सीजन सिलेंडरों के लिए बनाए जा रहे एमलेक्स को ऑक्सीजन सप्लाई लाइन तथा रोगी द्वारा पहने गए मास्क के बीच आसानी से कनेक्ट किया जा सकता है। यह एक सेंसर का उपयोग करता है जो किसी भी पर्यावरणगत स्थिति में उपयोगकर्ता द्वारा सांस लेने और छोड़ने को महसूस करता है और सफलतापूर्वक उसका पता लगाता है।" उपयोग के लिए तैयार यह डिवाइस किसी भी वाणिज्यिक रूप से उपलब्ध ऑक्सीजन थिरेपी मास्क के साथ काम करती है जिसमें वायु प्रवाह के लिए मल्टीपल ओपनिंग्स हों।

इस इनोवेशन की सराहना करते हुए लुधियाना के दयानन्द चिकित्सा महाविद्यालय के अनुसंधान एवं विकास, के निदेशक डॉ. जी.एस. वांडर ने कहा कि महामारी के वर्तमान समय में हम सभी ने जीवन रक्षक ऑक्सीजन के प्रभावी और व्यावहारिक उपयोग का महत्व सीख लिया है, इस प्रकार का एक डिवाइस वास्तव में छोटे ग्रामीण तथा अर्द्धशहरी स्वास्थ्य केन्द्रों में ऑक्सीजन के उपयोग को सीमित करने में सहायता कर सकती है।

प्रो. राजीव अरोड़ा ने कहा कि कोविड-19 से मुकाबला करने के लिए देश को अब त्वरित लेकिन सुरक्षित समाधानों की आवश्यकता है। चूंकि यह वायरस फेफड़ों और बाद में मरीज की श्वसन प्रणाली को प्रभावित कर रहा है, संस्थान की मंशा इस डिवाइस को पेटेंट कराने की नहीं है। उन्होंने कहा कि इसके बजाय आईआईटी, रोपड़ को राष्ट्र के हित में, वैसे लोगों के लिए जो डिवाइस का व्यापक उत्पादन करने के इच्छुक हैं, इस प्रौद्योगिकी को निशुल्क हस्तांतरित करने में खुशी होगी।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1737149>

