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समाचार पत्रों से चयित अंश
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जागरण

Tue, 3 May 2022

पोखरण में DRDO ने किया एडवांस टोड आर्टिलरी गन सिस्टम का सफल परीक्षण

भारत में 155 मिमी/52 कैल एडवांस्ड टोड आर्टिलरी गन सिस्टम (ATAGS) का सफल परीक्षण किया गया। बता दें कि इस प्रकिया को 26 अप्रैल से 2 मई के बीच पोखरण फील्ड फायरिंग रेंज (पीएफएफआर) में पूरा किया गया। इस बात की जानकारी रक्षा अनुसंधान और विकास संगठन (DRDO) के अधिकारियों ने सोमवार को दी।

क्या है ATAGS

आधुनिक सुविधाओं से लैस हथियार भारतीय सेना की ताकत दुगनी कर रहे हैं। इसी कड़ी में ATAGS भारतीय सेना के तोपखाने आधुनिकीकरण कार्यक्रम के एक हिस्से के रूप में, DRDO द्वारा मिशन मोड में पूरी तरह से, स्वदेशी टोड आर्टिलरी गन सिस्टम प्रोजेक्ट है।

ATAGS का उपयोग

ATAGS को डीआरडीओ द्वारा विकसित किया गया है, जबकि इसे भारत फोर्ज और टाटा एडवांस्ड सिस्टम्स लिमिटेड की दो फर्मों ने निर्मित किया गया है। कयास लगाया जा रहा है यह आधुनिक सुविधाओं से लैस बंदूक भारतीय सेना के टावर हावित्जर बेड़े का मुख्य आधार होगी, जिसका इस्तेमाल बोफोर्स हावित्जर को बदलने के लिए भी किया जा सकता है।

जनवरी 2017 में किया गया था प्रदर्शित

ATAGS का परीक्षण भले ही अभी हुआ है लेकिन सबसे पहले 26 जनवरी 2017 को गणतंत्र दिवस परेड पर लोगों के सामने दिखाया गया था। कैल एडवांस्ड टोड आर्टिलरी गन सिस्टम (ATAGS) के सफल परीक्षण से सेना को बड़ी ताकत मिली है, जिससे भविष्य की युनौतियों से निपटने के लिए सेना की मारक क्षमता को मजबूती मिलेगी।

https://www.jagran.com/news/national-drdo-successfully-test-fired-advanced-towed-artillery-gun-system-in-pokhran-22680044.html

TIMESNOW

Tue, 2 May 2022

DRDO conducts successful trials of ATAGS - Know more about this indigenously built towed artillery gun system

In yet another technological advancement, India has successfully conducted the trials of the indigenous Advanced Towed Artillery Gun System (ATAGS), being developed by the Defence Research and Development Organisation (DRDO). The trials of the gun system, considered to be the best in its class in the world, were conducted at Pokhran Field Firing Range (PFFR) between April 26 and May 2, the DRDO said as reported by news agency ANI. The ATAGS is a towed 155 mm x 52 calibre howitzer that is being developed for the Indian Army by the DRDO along with private firms Bharat Forge and TATA Power SED. The ATAGS project was started in 2013 by DRDO to replace older guns in service in the Indian Army with a modern 155mm artillery gun.

ATGAS is a large calibre Gun system with the capability to program and fire future Long-Range Guided Munitions (LRGM) to achieve precision and deep strike, according to the DRDO's website. As per the premiere agency, the system is configured with an all-electric drive that will ensure maintenance free and reliable operation over longer periods of time. It consists of a barrel of 6,875mm, breech mechanism, muzzle brake and recoil mechanism to fire 155 mm calibre ammunition with a firing range of 48 kilometre.

The howitzer is integrated with advanced features like high mobility, quick deployability, auxiliary power mode, automatic command and control system, and advanced communication system with night vision capability in direct-fire mode. According to the DRDO, it can fire three rounds in 15 seconds while in burst mode, and as many as 60 rounds in 60 minutes while in sustained mode. With a weight of 18 tonnes, it is said that the gun is two tons lighter than guns in the same category.

https://www.timesnownews.com/india/drdo-conducts-successful-trials-of-atags-know-more-about-this-indigenously-built-towed-artillery-gun-system-article-91268392

THE HINDU

Tue, 3 May 2022

Indigenous artillery gun passes validation trials

The indigenous Advanced Towed Artillery Gun System (ATAGS) developed by the Defence Research and Development Organisation (DRDO) jointly with the private industry crossed a milestone this week by successfully completing the validation trials towards meeting the specifications of the Army. The week-long Preliminary Service Quality Requirements (PSQR) validation retrials were conducted at the Pokhran field firing ranges from April 26 to May 2.

“Reliability of the guns were proven by conducting two second line of firing successfully. Accuracy and consistency were achieved, burst and intense timed series were also successfully evaluated during the trials,” a DRDO official told *The Hindu*.

“Following this, there are trials for Electromagnetic Interference/ Electromagnetic Compatibility (EMI/ EMC) and Director General Quality Assurance (DGQA) which are scheduled in May. The Request For Proposal (RFP) will be issued after that. We expect it by June.”

Stringent specifications

Stating that there are very stringent specifications for accuracy consistency, the officials said the performance during trials were well within the specifications. “Guns of both companies performed well. The successful re-validation trials paves the way for induction of the ATAGS into service,” the official stated. The ATAGS is a 155mm, 52-calibre heavy artillery gun jointly developed by Armament Research and Development Establishment (ARDE), the Pune-based laboratory of DRDO, in partnership with Bharat Forge and Tata Group. “The 155/52 mm ATAGS jointly developed by DRDO (ARDE) and TASL successfully completed PSQR firing trials today. A true example of Public-Private Partnership leading to a world class weapon system fully designed and developed in India. Such a weapon system is highly strategic for India,” Tata Advanced Systems Limited posted on Twitter on Monday.

In August, 2018 the Defence Acquisition Council had accorded approval for the purchase of 150 of these guns at an approximate cost of ₹3,365 crore which would be split between the two companies. The deal will be split in 60:40 ratio between the lowest bidder (L1) and L2. The Army has a requirement of 1,580 artillery guns in this category. As reported earlier, in the past, the Army had flagged the issue of overweight compared with its requirements which officials said has been addressed. The Army wanted the weight to be around 18 tonnes so that it can be carried in the mountains and that it is now by and large in that range, officials had stated earlier.

The ATAGS has demonstrated a range of over 45 km, and an official termed it as the “most consistent and accurate gun in the world”. It boasts of the shortest minimum range at high angle and fast mobility in desert and mountain terrain in addition to autonomous mode firing capability and wireless communication, officials said. It has been designed to fire all in-service ammunitions with a fully automatic ammunition handling system with all electronic drives, the official added.

https://www.thehindu.com/news/national/indigenous-artillery-gun-passes-validation-trials/article65378688.ece

DRDO On Twitter

Defence News

Defence Strategic: National/International

THE TIMES OF INDIA

Wed, 4 May 2022

5 years on, 'strategic partnership' Defence projects yet to take off

Five years after the (SP) model was promulgated to boost indigenous defence production through tie-ups with majors, not a single project has taken off under the much-touted 'Make in India' policy till now. The SP model projects identified by the ranged from the manufacture of new-generation submarines and helicopters to advanced fighters and futuristic main-battle tanks in

long-term joint ventures between Indian companies and OEMs (original equipment manufacturers) with “deep and extensive” transfers of technology.

But the first project to make six diesel-electric stealth submarines with airindependent propulsion for greater underwater endurance, at an initial estimated cost of Rs 43,000 crore under Project-75 India (P-75I), is still far away from the actual contract being inked after the long-winded initial shortlisting and tender process. The defence ministry in July last year issued the RFP (request for proposal) to defence shipyard and private shipbuilder L&T, who in turn were to join hands with one of the five shortlisted OEMs to submit technocommercial bids for the mega project. The foreign ship-builders were Naval Group-DCNS (France), (Russia), ThyssenKrupp Marine Systems (Germany), Navantia (Spain) and Daewoo (South Korea). “The French and Russians have already formally pulled out of the competition. Two others have also expressed concerns about the technical and commercial conditions,” a defence official said on Tuesday. The other SP projects have not even reached this preliminary stage. One of them is the ’s longpending acquisition of 111 armed, twin-engine utility choppers at a cost of over Rs 21,000 crore to replace its ageing fleet of single-engine Chetak helicopters. Another is IAF’s quest for 114 new 4.5-generation fighters with “some fifth-generation capabilities” for over Rs1.25 lakh crore, which has seven foreign contenders but is yet to be even granted the initial “acceptance of necessity” by the defence ministry. The Army in May-June last year had also issued a RFI (request for Information) for acquiring 1,770 “future ready combat vehicles” or tanks in a phased manner. “All the SP model projects are in the doldrums, putting a big question mark on the entire policy. In P-75I, for instance, the time for submission of bids has been repeatedly extended, and now stands at June 30,” another official said. “The pricing methodology of the SP model policy, notified in May 2017, is flawed. Moreover, long-term partnerships require assured and repeated orders, which is not permitted under the existing rules,” he added.

The SP model was initially meant to progressively build capabilities in the Indian private sector to design, develop and manufacture complex weapons for the future needs of the armed forces. “But then the public sector also muscled its way in. A relook at the entire policy is now needed,” an official said.

https://timesofindia.indiatimes.com/india/5-years-on-strategic-partnership-defence-projects-yet-to-take-off/articleshow/91296132.cms

Tue, 3 May 2022

India & Germany to focus on co-manufacturing Defence equipment, PM Modi extends invite to German Chancellor: MEA

New Delhi, May 3 (KNN) During his visit to Germany as part of Europe tour, Prime Minister Narendra Modi extended an invite to German Chancellor Olaf Scholz to visit India. Foreign Secretary of India Vinay Kwatra said, “Prime Minister Narendra Modi extended an invite to the German Chancellor to visit India and I think we'll work out the subsequent elements of it through

the regular diplomatic channels". The focus of defence partnership between two countries has been on how they can work together on co-designing, co-developing & co-manufacturing different elements of defence manufacturing. This has been the principal scope in which the development took place," he added.

The Foreign Secretary also acknowledged the matter of oil imports by India from Russia. "The quantum of oil imports by India from Russia is a small fraction of what the rest of the world imports from Russia. Ultimately we look at this from the perspective of energy security which not just India but other countries are also pursuing," he said

https://knnindia.co.in/news/newsdetails/global/india-germany-to-focus-on-co-manufacturing-defence-equipment-pm-modi-extends-invite-to-german-chancellor-mea

The Statesman

Tue, 3 May 2022

Hair-brained schemes will undermine our Defence

Addressing the Rashtriya Raksha University last month, the ex-army chief, General M M Naravane stated, "Whenever we talk about the armed forces, and whenever we talk about investments and expenditures made for the armed forces, we should see this as an investment – an investment on which you get full returns, and it should not be seen as a burden on the economy." He also mentioned that whenever there was a national security crisis the economy suffered, and added, "avoiding such kinds of shock can only happen if the armed forces of the country are strong." General Naravane's words were a cry to the government to listen to the forces, and stop pushing illogical schemes without assessment and consultation.

This is not the first time that armed forces have raised concerns about lack of funding impacting the development of capabilities as also fought tooth and nail against hair-brained schemes pushed by the government. General Bipin Rawat stated in a seminar in March 2018, "We have to build and develop confidence amongst investors that the nation's borders are secure, and the internal security situation is under control for which there is a requirement for budget for the defence forces." The fact that development needs security must never be ignored.

Service HQs have been compelled, due to a lack of funds to utilize equipment which should have been discarded decades ago, MIG 21 aircraft and Cheetah helicopters being examples. Both have been exploited beyond their shelf lives but cannot be discarded as replacements are slow. Modernization continues at a crawl. While funds recede, threats increase. Recent reports mention possibilities of the Chinese PLA attempting fresh incursions. The armed forces remain in a heightened state of alert along northern borders. In Kashmir, intelligence inputs indicate launch pads in POK are filled with terrorists awaiting infiltration. Our adversaries will always exploit any chinks in our armour.

There is a belief amongst policymakers in Delhi, cut away from reality, distant from the armed forces and with the ears of the political leadership, that future wars would be in the Grey Zone. Operations, if any, would be limited in scope, hence manpower can be reduced. This is based on

the premise that possession of nuclear weapons will preclude any major conflict. Their primary task remains to curtail the salary and pension component of the defence budget for which they keep inventing hair-brained schemes.

The reality is that Grey Zone warfare is perpetually ongoing. It would become predominant only when the adversary realizes that gaining claimed objectives by physical actions is impossible. While nuclear weapons may preclude large scale operations, the fact remains that India will not resort to a nuclear threat in response to terrorist actions and creeping operations with limited objectives. It is this that our adversaries have exploited. Further, despite alliances and partnerships, the nation would have to handle its security problems alone. The most that allies and partners would offer is sympathy and criticism of the adversary, none of which has any impact on the battlefield. Hence, our armed forces must possess capabilities to win wars when launched by the enemy and to deter its attempts at misadventure by possessing requisite power.

Power is a combination of capabilities, manpower and government policies. Government approval for countermeasures on both fronts has stalled misadventures by adversaries. In a region where demands on India are territorial, holding ground is essential for deterrence and denial. Once grabbed by an adversary, regaining without escalation is difficult. This has been proved in Ladakh. The government is responsible for ensuring that armed forces possess the requisite capabilities to deter the enemy. Being a democracy service chiefs would never accuse the government of failing to provide desired resources, though they may raise their concerns in discussions and debates. This was evident during the Kargil war, when the army chief, General Ved Malik, stated, “we will fight with what we have,” aware that there were gaping shortcomings in capabilities, which Pakistan exploited.

General Rawat had stated in an interview, “We were always tasked for defending our borders. And when you have unsettled borders on your north and west, you don’t know which side the battle will commence and where it will end. So, you should be prepared on both fronts.” While the armed forces mention two fronts, the government has a different perception. For years the government perceived that diplomacy and trade would contain the Chinese threat, while the armed forces could handle Pakistan and the terrorist threat. This misbelief led to low defence budgets.

Thus were born Indo-China summits.

However, diplomacy failed with Doklam and subsequently with Ladakh. It continues to fall short at pushing the Chinese to withdraw to pre-April 2020 positions, thereby placing the onus of keeping them at bay on the armed forces. India’s recognition as a major global player is determined by its ability to thwart offensive designs by China. For achieving this, the armed forces need trained and motivated manpower. Currently, there are multiple schemes being pushed by protected bureaucratic elements, after obtaining approval of the national leadership, without consultation of service HQs, for curtailing manpower as also reducing salaries and pensions by various schemes. While these may appear logical to a non-military mind, they have inherent shortcomings impacting defence preparedness for which views of service HQs are paramount.

Currently, forces are compelled to counter what has been approved by the national leadership. This happens because the nation lacks a politico-bureaucratic-military interface to jointly discuss suggestions prior to rushing them to the national leadership. This shortfall is because the bureaucracy and the forces continue to distrust each other and play the one-upmanship game.

Arbitrary decisions, taken by those unaware of operational realities degrade organizational efficiency rather than improve it. There is a need to rethink what we truly need, an armed force capable of posing a threat to our adversaries or one suppressed into losing its teeth due to budgetary constraints and hair-brained schemes dreamt up by those who desire to please their political masters. The government should realize that investment in military capabilities is not an expenditure but an insurance policy which safeguards the global standing of the nation.

https://www.thestatesman.com/opinion/hair-brained-schemes-will-undermine-defence-1503067227.html

THE HANS INDIA

Wed, 4 May 2022

French Defence firm pulls out of India's P-75I project

French company Naval Group on Tuesday said it is unable to participate in Centre's P-75I project, under which six conventional submarines are to be domestically built for the Indian Navy, due to conditions mentioned in the request for proposal (RFP) related to air independent propulsion (AIP) system. Naval Group's announcement comes a day before Prime Minister Narendra Modi's visit to Paris where he is scheduled meet recently re-elected French President Emmanuel Macron. AIP system allows a conventional submarine to stay submerged in water at higher speeds for a longer period of time. The Rs 43,000 crore-contract will be awarded by the defence ministry following a detailed evaluation of the responses sent by the two strategic partners.

https://www.thehansindia.com/news/national/french-defence-firm-pulls-out-of-indias-p-75i-project-740911?infinitescroll=1

DefenseNews

Mon, 2 May 2022

US Army scrambles to keep its new air-defense radar on schedule

Raytheon has run into problems building the first prototypes of the U.S. Army's new air-and-missile defense radar that will replace the Patriot system's sensor, but the service still aims to deliver four of them by the end of 2023."The LTAMDS program continues to adjust schedules to mitigate system integration challenges and supply chain issues caused by COVID supply chain issues," the Army's Program Executive Office for Missiles and Space told Defense News in a statement. The Army "will continue to make necessary test schedule adjustments to meet the congressional mandate of fielding one LTAMDS Battalion (four sensors) by December 2023," the office said. Raytheon was awarded a $384 million contract in October 2019 to develop and

build six urgent materiel release versions of the system, the Army noted. Four of them will be used to satisfy Congress's intent to field an urgent capability.

The program experienced a variety of schedule slips, some roughly by a year, according to the fiscal year 2023 Army budget justification documents. While the Army originally planned to begin product representative unit manufacturing in the first quarter of FY20, that did not start until the first quarter of FY21. Plans to wrap up manufacturing would have ended in the fourth quarter of FY22 but that has now moved to the fourth quarter of FY23. Qualification testing originally planned to begin in the first quarter of FY22 and end in the fourth quarter of FY22 will not begin until the fourth quarter of FY22. But testing will end in the first quarter of FY23, according to the documents.

Development testing that was supposed to happen in FY22 will not take place until the third quarter of FY23 and an operational test event will happen in the second quarter of FY23 rather than in the third quarter of FY22. An operational assessment and integrated fires campaign will take place starting the third quarter of FY23 and will wrap up in the fourth quarter of FY23. According to FY22 justification books, the Army had planned to reach an initial operational capability in the fourth quarter of FY22, but now plans to issue an urgent materiel release one year later than that. The Army is now planning to make a production decision for LTAMDS in the first quarter of FY24, the budget documents note.

"The LTAMDS prime vendor, Raytheon, provides regular updates to the schedule and continues to coordinate with the U.S. government to make necessary test schedule adjustments to meet warfighter requirements and the congressional mandate," the Army included in its statement. In an interview this March, Brig. Gen. Robert Rasch, program executive officer for Army missiles and space, told Defense News that the service was about to receive the first of the LTAMDS radars, expected in April, to begin government testing at White Sands Missile Range, New Mexico. The Army has been working toward a replacement for the Raytheon-made Patriot system for well over a decade, but along with the LTAMDS radar, it is closing in on bringing some key capabilities of its future system to bear this year.

The linchpin of the Army's future Integrated Air and Missile Defense System – the Northrop Grumman-made Integrated Battle Command System, or IBCS – will complete its critical initial operational test and evaluation in 2022. A full-rate production decision on the command-and-control system is expected in FY23. The Army is also accelerating its plans to replace Lockheed Martin-made Patriot missiles. The service will make a contract award to a single vendor through a competitive process in the third quarter of FY26, but will begin the process in mid-FY23. Plans for a future launcher have yet to materialize, and the Army is conducting analyses and evaluating what will be needed for the system.

https://www.defensenews.com/land/2022/05/02/us-army-scrambles-to-keep-its-new-air-defense-radar-on-schedule/

Press Information Bureau
Government of India

Ministry of Science & Technology

Tue, 3 May 2022 3:21

India and Germany agree to work together with focus on Artificial Intelligence (AI) Start-Ups as well as 'AI' research and its application in Sustainability and Health care

Union Science and Technology Minister Dr Jitendra Singh held bilateral talks with German Minister for Education & Research Ms. Bettina Stark-Watzinger in Berlin and expressed satisfaction over the ongoing bilateral Science & Technology Cooperation

Frontier areas like Electric Mobility, Cyber Physical System, Quantum Technologies, Future Manufacturing, Green Hydrogen Fuel, Deep Ocean research are emerging as new areas of partnership between India and Germany: Dr Jitendra Singh PM India and Germany have agreed to work together with focus on Artificial Intelligence ('AI') StartUps as well as AI research and its application in Sustainability and Health care, said Dr Jitendra Singh, Minister for Science & Technology and Earth Sciences after his "bilateral" talks with German Minister for Education & Research, Bettina Stark-Watzinger. Both the Ministers agreed that there is a lot of scope to work together in Artificial Intelligence for which experts on two sides have already met. An Indo-German call for proposals for this would be raised soon inviting proposals from researchers and industry.

Dr Jitendra Singh recalled that in November 2019, during Chancellor Merkel's visit to Delhi, Germany and India had agreed to establish a joint research programme in Artificial Intelligence. They also decided on the extension of the Indo-German Partnership in Higher Education for another four years, with contributions of 3.5 Million Euros each. Both India and Germany have expressed satisfaction on the ongoing Science & Technology Cooperation between the two countries which is one of the strategic pillars of our bilateral relationship. Academia, Research Institutions and Industries of both countries have strong bonding and are playing the role of catalyst in our strategic research and development partnerships. On the third day of his official engagement in Berlin, Dr Jitendra Singh mentioned that both the countries are now working in frontier areas of science & technology, including Electric Mobility, Cyber Physical System, Quantum Technologies, Future Manufacturing, Green Hydrogen Fuel, Deep Ocean research and proposed to develop joint cooperation in these areas. Two countries have already started mapping each other's strength in areas like application of Artificial Intelligence in Sustainability and Healthcare.

Both the Ministers expressed satisfaction on recently concluded MOU between Department of Science & Technology, Govt. of India and German Research Foundation (DFG) to support the International Research Training Groups (IRTG) program would further boost the cooperation towards capacity building targeting the training of Indian and German students for pursuing the PhD program. The maiden call for inviting proposals under this program from Indian and German research groups is already on. Both Ministers felt delighted that several initiatives for human capacity developments in science and engineering have recently been worked out, which includes Women Involvement in Science and Engineering Research (WISER) to facilitate lateral entry of women researchers into ongoing S&T projects and Paired Early Career Fellowships creating an inclusive ecosystem for the Indo-German S&T cooperation with exchange of young researchers on both sides. Industrial Fellowships aimed at industrial exposure of young Indian researchers in a German industrial ecosystem.

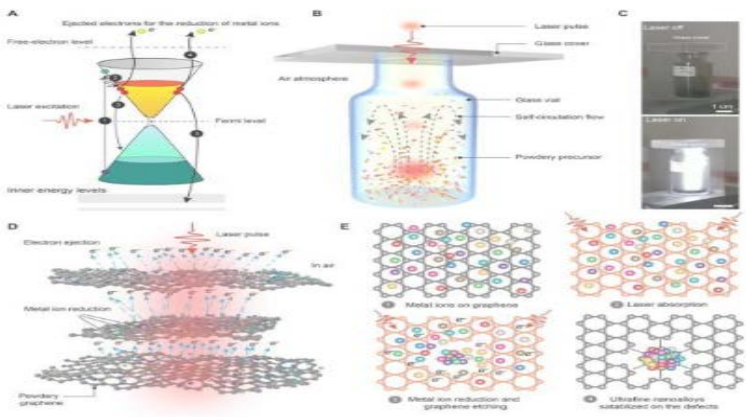
Dr Jitendra Singh mentioned that the Government of India under the leadership of Prime Minister Narendra Modi gives great importance to innovation. The present Government puts emphasis on promoting the value chain of innovation, entrepreneurship and IP generation. Indian innovation system is more purpose driven rather than process driven with focus on affordability and accessibility. Bettina Stark-Watzinger supported the idea to further strengthen bilateral scientific cooperation by partnering in emerging science & technology areas where both Germany and India have strength to work together and serve two societies.

https://pib.gov.in/PressReleasePage.aspx?PRID=1822324

Tue, 3 May 2022

Building nanoalloy libraries from laser-induced thermionic emission reduction experiments

High-entropy nanoalloys (HENA) have widespread applications in materials science and applied physics. However, their synthesis is challenging due to slow kinetics that cause phase segregation, sophisticated pretreatment of precursors, and inert conditions. In a new report now published in *Science Advances*, Haoqing Jiang and a team of scientists in industrial engineering, nanotechnology and materials science in the U.S., and China, described a process of converting metal salts to ultrafine HENAs on carbonaceous supports using nanosecond pulse lasers. Based on the unique laser induced thermionic emission and etch on carbon, the team gathered the reduced metal elements of ultrafine HENAs stabilized via the defective carbon support. The resulting process produced a variety of HENAs ranging from 1-to-3 nanometers and metal elements of up to 11 grams per hour, with a productivity reaching 7 grams per hour. The HENAs exhibited excellent catalytic performance during oxygen reduction, with great practical potential.



The LITER for the synthesis of nanoalloys. (A) Illustration of the laser-induced t..

Metal nanoalloys form critical catalysts with widespread applications in chemical reactions across energy fields and environmental science. During conventional bottom-up engineering routes, such as wet chemistry techniques deployed by chemists to synthesize metal nanoalloys, the miscibility of each metallic element in the phase diagram can avoid phase segregation during particle formation. High-entropy nanoalloys (HENAs) with equal stoichiometric ratios of various metals within each particle, have gained much interest due to their unusual physical and chemical properties. These properties make them attractive catalysts for oxygen reduction reactions with ample applications across fields. Materials scientists have shown how slow kinetics in traditional methods challenge the process, leading to phase segregation in nanoalloys, and have developed a range of methods to tackle these challenges. In this work, Jiang et al discussed the direct fabrication of supported ultrafine HENAs based on nanosecond pulsed laser reduction of metal salts on carbonaceous supports. The ultrafast laser reaction preceded the phase separation of alloys, to synthesize libraries of alloys as a straightforward and convenient method, compared to previous experiments.

Methods: Laser-induced thermionic emission reduction (LITER)

During the experiments, Jiang et al precisely delivered laser packages with a pulse duration of 5 nanoseconds, and a pulse energy of up to 600 mJ to carbonaceous supports to generate an obvious plasma plume with electron jet flow. The scientists implemented a three-step process; during the first step, they facilitated the carbonaceous support to absorb laser photons to generate metal ions and electrons, followed by high-temperature conditions to initiate the reduction and etching of the carbonaceous support. Finally, Jiang et al instantly cooled the reduced metal atoms after laser irradiation for assimilation into ultrafine nanoalloys on the defect site of the carbon support. The process yielded HENAs with uniform sizes and even distribution on the supports. The team named this process the laser-induced thermionic emission reduction, abbreviated as LITER.

The LITER (laser-induced thermionic emission reduction) method predominantly included two steps: loading metal salts on carbonaceous supports to form the precursor and laser treatment on the precursor. Jiang et al used four-layered graphene supported HENAs as examples to demonstrate the method. At first, they dispersed a few-layered graphene powder in the ethanol solvent with chloride metal salts under stirring. After evaporating the ethanol solvent under

vacuum, they obtained the graphene-supported metal precursor, then loaded it into a glass vial to subject the metal precursor to nanosecond laser pulses in air. The spot size of the laser pulses was 5 nm with laser pulse energy of 620 mJ. During laser pulse interactions, they formed high density plasma plumes to propel the graphene flakes across the whole container. Upon laser irradiation, the graphene layer absorbed the laser pulse for heat conversion to form a high-temperature local environment suited for metal salt pyrolysis. After laser exposure, the metal salts decomposed rapidly to form metal atoms to facilitate the formation of HENAs without phase separation.

Precursor synthesis and metal salt reduction

Before HENA (high-entropy nanoalloy) synthesis, Jiang et al developed ultrafine platinum nanoparticles on few-layered graphene using LITER to investigate laser reduction under atmospheric conditions. To prepare the precursor, they wet impregnated platinum tetrachloride ($PtCl_4$) salt on the surface of few-layered graphene and dried the sample under vacuum to obtain a black powder. The team loaded this precursor into a glass vial for laser treatment of the product. The laser pulse produced an energy pulse of 620 mJ at a pulse duration of 5 ns, with a spot size of 5 mm and wavelength of 1,064 nm to initiate the reduction of metal salts via laser pulse, and generated a plasma plume. After laser irradiation, they soaked the black powder to dissolve unreacted salts under vacuum drying.

Materials characterization and applications of HENA

They characterized the product via microscopy to reveal its structure, using scanning electron microscopy to show how the product identified to pristine few-layered graphene and using transmission electron microscopy and high-angle annular dark field images, they revealed the morphology of the product with uniform and even distribution. The uniform nanoparticles formed on graphene also exhibited identical selected-area electron diffraction patterns. Jiang et al. showed that LITER (laser-induced thermionic emission reduction) can be generalized to develop a large variety of nanoalloys on graphene by loading designated metal salts on the precursors as identified using elemental mappings from energy dispersive spectroscopy. The team further studied the stoichiometric ratio and chemical state of the elements in HENAs (high-entropy nanoalloys) using the same technique, as well as X-ray photoelectron spectroscopy to reveal the chemical states of the elements. Jiang et al next conducted electrochemical performance analysis to understand the function of HENAs by fabricating them on carbon nanotubes. They setup a conventional rotating disk electrode to evaluate catalytic performance using linear sweep voltammetry measurements. The team believe that rational screening of HENAs by computer or other methods can lead to the discovery of advanced catalysts with better performance.

Outlook

In this way, Haoqing Jiang and colleagues described the refinement of uniform high-entropy nanoalloys (HENAs) via the corresponding metal salt precursors under direct laser-induced thermionic emission on graphene, and on carbon nanotubes in nanoseconds. The resulting HENA nanostructures delivered remarkable catalytic performance in oxygen reduction reactions. The laser-induced thermionic emission reduction (LITER) method introduced in this work is an advanced method to mix a variety of elements into ultra-small alloys in a scalable and energy-efficient manner. The scientists envision integrating the rich combination of elements, the

ultrafast laser technology and nanoscale features to produce alloy libraries with a variety of properties for widespread applications.

https://phys.org/news/2022-05-nanoalloy-libraries-laser-induced-thermionic-emission.html

The Indian EXPRESS

Tue, 3 May 2022

Rocket lab catches, drops rocket booster with helicopter in key reusability test

Rocket Lab on Monday captured a falling rocket stage out of the air with a helicopter before dropping it in the ocean. Small launch firm Rocket Lab USA Inc on Monday captured a falling rocket stage out of the air with a helicopter before dropping it in the ocean, appearing to achieve a partially successful test of the company's novel cost-savings approach to recovering used rockets for multiple mission to space. The demonstration, involving parachutes and a long cable hanging from a helicopter, sought to check off a key milestone for the Long Beach, California-based company as it ventures to slash the cost of sending things into space, an industry trend pioneered by billionaire entrepreneur Elon Musk's SpaceX.

After lifting off to send 34 satellites toward orbit at 10:50 a.m. (2250 GMT) in New Zealand, the Long Beach, California-based company's four-story-tall Electron booster stage fell back through Earth's atmosphere and deployed a series of parachutes to brake its speed. At high altitudes above the South Pacific, just off the New Zealand coast, a helicopter hanging a long, vertical cable from its underside was steered by two pilots over the booster, which had stretched to its side a capture line as it descended under a parachute at roughly 22 miles (35 km) per hour. The helicopter cable latched onto the booster's capture line, as seen on the company's live stream, prompting cheers and applause from Rocket Lab engineers in the company's mission control center in Long Beach.

But the cheers from engineers turned to audible groans as the helicopter pilots were forced to release the rocket from the cable and dunk it into the Pacific Ocean after noticing "different load characteristics" than what had been experienced during previous capture tests, a Rocket Lab spokesperson later confirmed. A fully successful test would have involved carrying the rocket booster back to land or onto a barge without having it touch ocean water. "No big deal," Rocket Lab Chief Executive Peter Beck wrote on Twitter. "The rocket splashed down safely and the ship is loading it now." It was not immediately clear whether Rocket Lab planned to reuse the booster.

https://indianexpress.com/article/technology/science/rocket-lab-catches-drops-rocket-booster-with-helicopter-in-key-reusability-test-7899138/lite/

Tue, 3 May 2022

From seawater to drinking water at the push of a button – with no filters!

Researchers build a portable desalination unit that generates clear, clean drinking water without the need for filters or high-pressure pumps. MIT researchers have developed a portable desalination unit, weighing less than 10 kilograms (22 pounds), that can remove particles and salts to generate fresh drinking water. The device, which is about the size of a suitcase, needs less power to operate than a cell phone charger. It can also be driven by a small, portable solar panel, which can be purchased online for around $50. It automatically generates drinking water that exceeds World Health Organization (WHO) quality standards. The technology is packaged into a user-friendly device that runs with the push of a single button.

Unlike other portable desalination devices that require water to pass through filters, this unit utilizes electrical power to remove particles from drinking water. Eliminating the need for replacement filters significantly reduces the long-term maintenance requirements.

This could enable the unit to be deployed in remote and severely resource-limited areas, such as communities on small islands or aboard seafaring cargo ships. It could also be used to aid refugees fleeing natural disasters or by soldiers carrying out long-term military operations.

“This is really the culmination of a 10-year journey that I and my group have been on. We worked for years on the physics behind individual desalination processes, but pushing all those advances into a box, building a system, and demonstrating it in the ocean, that was a really meaningful and rewarding experience for me,” says senior author Jongyoon Han, a professor of electrical engineering and computer science and of biological engineering, and a member of the Research Laboratory of Electronics (RLE). Joining Han on the paper are first author Junghyo Yoon, a research scientist in RLE; Hyukjin J. Kwon, a former postdoc; SungKu Kang, a postdoc at Northeastern University; and Eric Brack of the U.S. Army Combat Capabilities Development Command (DEVCOM). The research has been published online in the journal *Environmental* Science and Technology.

Filter-free technology

Commercially available portable desalination units typically require high-pressure pumps to push water through filters, which are very difficult to miniaturize without compromising the energy-efficiency of the device, explains Yoon. Instead, their unit relies on a technique called ion concentration polarization (ICP), which was pioneered by Han’s group more than 10 years ago. Rather than filtering water, the ICP process applies an electrical field to membranes placed above and below a channel of water. The membranes repel positively or negatively charged particles — including salt molecules, bacteria, and viruses — as they flow past. The charged particles are funneled into a second stream of water that is eventually discharged.

The process removes both dissolved and suspended solids, allowing clean water to pass through the channel. Since it only requires a low-pressure pump, ICP uses less energy than other

techniques. But ICP does not always remove all the salts floating in the middle of the channel. So the researchers incorporated a second process, known as electrodialysis, to remove remaining salt ions. Yoon and Kang used machine learning to find the ideal combination of ICP and electrodialysis modules. The optimal setup includes a two-stage ICP process, with water flowing through six modules in the first stage then through three in the second stage, followed by a single electrodialysis process. This minimized energy usage while ensuring the process remains self-cleaning.

“While it is true that some charged particles could be captured on the ion exchange membrane, if they get trapped, we just reverse the polarity of the electric field and the charged particles can be easily removed,” Yoon explains. They shrunk and stacked the ICP and electrodialysis modules to improve their energy efficiency and enable them to fit inside a portable device. The researchers designed the device for nonexperts, with just one button to launch the automatic desalination and purification process. Once the salinity level and the number of particles decrease to specific thresholds, the device notifies the user that the water is drinkable. The researchers also created a smartphone app that can control the unit wirelessly and report real-time data on power consumption and water salinity.

https://scitechdaily.com/from-seawater-to-drinking-water-at-the-push-of-a-button-with-no-filters/

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