

CLEO: 2011 presentation [CMP1](#):

“Composite All-Ceramics, Passively Q-switched Nd:YAG/Cr<sup>4+</sup>:YAG Monolithic Micro-Laser with Two-Beam Output for Multi-Point Ignition,” by [Nicolae Pavel](#) of Romania’s National Institute for Laser, Plasma and Radiation Physics; Takunori Taira and Masaki Tsunekane of Japan’s Institute for Molecular Science; and Kenji Kanehara of Nippon Soken, Inc., Japan, is at 1:30 p.m. Monday, May 2 in the Baltimore Convention Center.

1. OSA News Release:

[http://www.osa.org/About\\_Osa/Newsroom/News\\_Releases/Releases/04.2011/LaserSparksRevolution.aspx](http://www.osa.org/About_Osa/Newsroom/News_Releases/Releases/04.2011/LaserSparksRevolution.aspx)

The screenshot shows the OSA website with a navigation menu and a news release. The news release title is "LASER SPARKS REVOLUTION IN INTERNAL COMBUSTION ENGINES". The text discusses a new laser system that may lead to reduced auto emissions and enhanced fuel efficiency. It mentions a Washington press conference on April 20, 2011, where researchers from Japan described the first multibeam laser system small enough to screw into an engine's cylinder head. The release also notes that the new laser system is made from ceramics and could be produced inexpensively in large volumes. A photo shows a standard spark plug and a micro-laser with three-beam output for multi-point ignition.

2. CLEO 2011 Conference:

<http://l.wbx.me/?p=1&instId=981fca17-69b6-46c6-842d-1d962e7e0801&token=55c1687f1746333b31f26a2d5bd8720b20718c1d0000012fac174005&u=http%3A%2F%2Fblog.cleoconference.org%2F2011%2F04%2Fphotonic-spark-plugs-zero-to-ten-millijoules-in-just-a-nanosecond%2F>

CLEO:2011 LASER SCIENCE TO PHOTONIC APPLICATIONS. 1-6 May 2011 BALTIMORE CONVENTION CENTER, Baltimore, Maryland, U.S.A. • Short Courses: T-3 • Technical Conference • Exposition: 3-5 May

Ad 27 Photonic Spark Plugs: Zero to Ten Millijoules in just a Nanosecond By James VanHove - CLEO Conference



Prototype of a photonic spark plug using Q-switched Nd:YAG:Cr<sup>4+</sup>:YAG microlasers (top), and a standard automobile spark plug (bottom). Photo from Takunori Taira, National Institutes of Natural Sciences, Japan.

This post originally appeared on Jim's Cleo Blog and is reproduced with permission from its author.

An April 20, CLEO press release recently caught the eye of the BBC News, and with good reason. A Japanese and Romanian collaboration will show data at CLEO from a 10 mm, multi-beam, ceramic laser whose beams can reach energies greater than 10 millijoules over a 800 picosecond pulse width, to ignite fuel for internal combustion.

The research behind the photonic spark plug will be presented in, CMP1 "Composite All-Ceramics, Passively Q-switched Nd:YAG/Cr<sup>4+</sup>:YAG Monolithic Micro-Laser with Two-Beam Output for Multi-Point Ignition" on May 2, at 1:30 pm, by Takunori Taira and Masaki Tsunekane from the Laser Research Center in Okazaki, Japan, in collaboration with Kenji Kanehara from Nippon Soken, Inc. in Japan, and Nicolae Pavel of Romania's National Institute for Laser, Plasma and Radiation Physics in Romania.

3. BBC News Science & Environment: <http://www.bbc.co.uk/news/science-environment-13160950>

The screenshot shows the BBC News website interface. At the top, there's a navigation bar with 'BBC Mobile' and links for News, Sport, Weather, Travel, TV, Radio, and More. Below that, the main header reads 'NEWS SCIENCE & ENVIRONMENT'. A secondary navigation bar lists various regions: Home, UK, Africa, Asia-Pac, Europe, Latin America, Mid-East, South Asia, US & Canada, Business, Health, and Sci/Environment. The article is dated '24 April 2011' and was last updated at '00:36 GMT'. It has 5,062 shares and social media icons for Facebook, Twitter, and Email. The title is 'Lasers could replace spark plugs in car engines' by Jason Palmer, a science and technology reporter for BBC News. The main text states that a team at the Conference on Lasers and Electro-Optics will report on May 1 that they have designed lasers that could ignite the fuel/air mixture in combustion engines. This approach would increase efficiency and reduce pollution. An image shows a standard spark plug and a micro-laser for multi-point ignition. A caption below the image says: 'Two or three lasers are focused to ignite fuel in more than one place.'

4. Discovery News: <http://news.discovery.com/tech/laser-car-engine-power-110502.html#mkcpgn=rssnws1>

The screenshot shows the Discovery News website. The header includes the Discovery News logo and the tagline '... is grateful for Navy Seal dogs.' Below the header is a navigation bar with categories: EARTH, SPACE, TECH, ANIMALS, DINOSAURS, ARCHAEOLOGY, HISTORY, and HUMAN. The article title is 'Lasers could replace spark plugs in car engines'. The main text states that Japanese researchers have created an automotive laser system to replace spark plugs. The system uses tiny ceramic lasers to ignite the air and fuel mixture with concentrated optical energy. The durable laser system has the potential to improve fuel efficiency and engine performance. An image shows a standard spark plug and a micro-laser for multi-point ignition. A caption below the image says: 'A standard spark plug (left) and the micro-laser for multi-point ignition (right). Click to enlarge this image. Takunori Taira'. The article also includes a quote from Takunori Taira, an associate professor of laser research at the Institute for Molecular Science in Okazaki, Japan, who developed the new system.

5. Laser Focus World:  
[http://www.optoiq.com/index/photonic-technologies-applications/lfw-display/lfw-article-display.articles.optoiq2.photonics-technologies.news.lasers-and\\_sources.2011.4.Laser-spark-plugs.html](http://www.optoiq.com/index/photonic-technologies-applications/lfw-display/lfw-article-display.articles.optoiq2.photonics-technologies.news.lasers-and_sources.2011.4.Laser-spark-plugs.html)

The screenshot shows the Laser Focus World website. The header includes navigation links: Home, Photonics, Industrial Lasers, Biophotonics, Market Research, White Papers, Webcasts, and Con. Below the header is a search bar and social media icons for Print, Email, Save, and Share. The article title is 'Laser ignition could replace automobile spark plugs'. The article is dated 'Apr 21, 2011'. The main text states that at this year's Conference on Lasers and Electro Optics (CLEO-2011) in Baltimore, MD, researchers from Japan will describe the first multibeam laser system that could be used to ignite an automobile engine's air-fuel mixture. The laser ignition system is small enough to screw into an engine's cylinder head and could replace the spark plugs used for more than 150 years to ignite combustion in internal combustion engines, enabling automakers to develop cleaner, more efficient, and more economical vehicles using photonics. Equally significant, the new laser system is made from ceramics, and could be produced inexpensively in large volumes, according to one of the presentation's authors, Takunori Taira of Japan's National Institutes of Natural Sciences. According to Taira, conventional spark plugs pose a barrier to improving fuel economy and reducing emissions of nitrogen oxides (NOx), a key component of smog. Spark plugs work by sending small, high-voltage electrical sparks across a gap between two metal electrodes. The spark ignites the air-fuel mixture in the engine's cylinder—producing a controlled explosion that forces the piston down to the bottom of the cylinder, generating the horsepower needed to move the vehicle. Engines make NOx as a byproduct of combustion. If engines ran leaner—burnt more air and less fuel—they would produce significantly smaller NOx emissions. Spark plugs can ignite leaner fuel mixtures, but only by increasing spark energy. Unfortunately, these high voltages erode spark plug electrodes so fast, the solution is not economical. By contrast, lasers, which ignite the air-fuel mixture with concentrated optical energy, have no electrodes and are not affected.

6. Science News:

<http://esciencenews.com/articles/2011/04/20/laser.sparks.revolution.internal.combustion.engines>

The screenshot shows the Science News website interface. At the top, there's a navigation bar with 'About', 'Spread the word!', 'Science news archive', and 'Contact'. Below that, a search bar and social media links are visible. The main content area features the article title 'Laser sparks revolution in internal combustion engines' and a 'Share' section with options like 'Email to a Friend', 'Print this Article', 'Twitter', 'Facebook', 'Delicious', 'StumbleUpon', and 'Reddit'. To the right, there are 'Other sources' and a 'Latest Science Newsletter' sign-up box.

7. Photonics Online:

<http://www.photonicsonline.com/article.mvc/Laser-Sparks-Revolution-In-Internal-0001>

The screenshot displays the Photonics Online website. It features a search bar at the top and a navigation menu. The main article is titled 'Laser Sparks Revolution In Internal Combustion Engines' and includes a sub-headline: 'New laser system may lead to reduced auto emissions, enhanced fuel efficiency'. The article text discusses the use of laser igniters in internal combustion engines. A sidebar on the left provides a 'Photonics Quick Search' with various categories like 'Cameras / Imaging', 'Laser Drivers / Mounts', etc. A 'Most Popular' section is also visible on the right.

8. Science Newline Technology:

<http://www.sciencenewline.com/technology/201104211300024.html>

The screenshot shows the Science Newline Technology website. The article is titled 'Laser sparks revolution in internal combustion engines' and is dated April 21, 2011. The main image shows two spark plugs. Below the image, there's a 'Featured Technology' section with a small robot icon and the text 'nanotechnology | particle accelerator'. The article text begins with 'WASHINGTON, April 20—For more than 150 years, spark plugs have powered internal combustion engines. Automakers are now one step closer to being able to replace this long-standing technology with laser igniters, which will enable cleaner, more efficient, and more economical vehicles.'

April 27, 2011, 2:42 PM

## Spark Plugs: Joining Carburetors on the Automotive Scrap Heap?

By PAUL STENQUIST

A team from Romania and Japan has developed a multibeam laser system that can reportedly replace the spark plug as a means of igniting fuel in a gasoline internal combustion engine. [According to a BBC report](#), the team will present its findings at the Conference on Lasers and Electro-Optics, scheduled for May 1 in Baltimore.

The development team claims that its laser device does not, like a spark plug, lose its ability to perform over time.

The spark plug is one of very few engine parts that must be replaced at regular intervals. Back in the days of leaded fuel and low-voltage ignition, plugs had to be swapped out about every 10,000 miles, but because of high-voltage electronic ignition, improved electrode materials and unleaded fuel, spark plugs can now last 100,000 miles.

9. New York Times:

<http://wheels.blogs.nytimes.com/2011/04/27/spark-plugs-joining-carburetors-on-the-automotive-scrap-heap/>



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## Multibeam laser aims to improve engine efficiency and emissions

Published by: David Lloyd — Tue 03 May 2011  
Channels: [Additive](#), [Rapid & Specialised Processes](#)  
Tags: [engines](#) | [laser](#)

A team of researchers, headed by Takunori Taira, has developed a multibeam laser system small enough to fit into an engine cylinder head, making for a more efficient and economical alternative to traditional spark plugs.



*Image courtesy of Takunori Taira, National Institutes of Natural Sciences, Japan*

Research into the new laser igniters will be presented at this year's Conference on Lasers and Electro Optics (CLEO) in Baltimore.

Taira believes existing spark plugs prove problematic when addressing the long term goal of improving fuel economy and reducing nitrogen oxides (NOx) produced by engines as a result of combustion.

An engine that ran leaner by burning more air and less fuel could offer a reduction in NOx emissions.

The high voltages needed to ignite leaner air-fuel mixtures are damaging to the electrodes used on traditional spark plugs, which isn't a problem for lasers as they use concentrated optical energy for ignition.

10. MW Advanced Manufacturing:

<http://www.advancedmanufacturing.co.uk/news/multibeam-laser-aims-improve-engine-efficiency-and-emissions>

## NANO PATENTS AND INNOVATION

NANO PATENTS AND INNOVATIONS IS DEDICATED TO NANOTECHNOLOGY NEWS, PATENTS, MARKETS, PRODUCTS AND RESEARCH INNOVATIONS

WEDNESDAY, APRIL 20, 2011

### Laser Sparks Revolution In Internal Combustion Engines: New Laser System May Lead To Reduced Auto Emissions, Enhanced Fuel Efficiency

For more than 150 years, spark plugs have powered internal combustion engines. Automakers are now one step closer to being able to replace this long-standing technology with laser igniters, which will enable cleaner, more efficient, and more economical vehicles.

In the past, lasers strong enough to ignite an engine's air-fuel mixtures were too large to fit under an automobile's hood. At this year's Conference on Lasers and Electro Optics (CLEO: 2011), to be held in Baltimore May 1 - 6, researchers from Japan will describe the first multibeam laser system small enough to screw into an engine's cylinder head.

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11. Nano Patents and Innovations:

<http://nanopatentsandinnovations.blogspot.com/2011/04/laser-sparks-revolution-in-internal.html>

# PRODUCT DESIGN & DEVELOPMENT™

## Laser Sparks Revolution in Internal Combustion Engines

By Optical Society of America

Wed

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WASHINGTON, April 20—For more than 150 years, spark plugs have powered internal combustion engines. Automakers are now one step closer to being able to replace this long-standing technology with laser igniters, which will enable cleaner, more efficient, and more economical vehicles.

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Equally significant, the new laser system is made from ceramics, and could be produced inexpensively in large volumes, according to one of the presentation's authors, Takunori Taira of Japan's National Institutes of Natural Sciences.

According to Taira, conventional spark plugs pose a barrier to improving fuel economy and reducing emissions of nitrogen oxides (NOx), a key component of smog.

Spark plugs work by sending small, high-voltage electrical sparks across a gap between two metal electrodes. The spark ignites the air-fuel mixture in the engine's cylinder—producing a controlled explosion that forces the piston down to the bottom of the cylinder, generating the horsepower needed to move the vehicle.

### 12. Product Design & Development:

<http://www.pddnet.com/news-lasers-sparks-revolution-in-internal-combustion-engines-042011/>

### 13. EurekAlert! (AAAS science news wire): Press Release / Breaking News:

<http://www.eurekalert.org/>  
<http://www.eurekalert.org/pubnews.php?start=75>  
[http://www.eurekalert.org/pub\\_releases/2011-04/osa-lsr042011.php](http://www.eurekalert.org/pub_releases/2011-04/osa-lsr042011.php)



Public release date: 20-Apr-2011  
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Contact: Angela Stark  
astark@osa.org  
202-416-1443  
Optical Society of America



#### Laser sparks revolution in internal combustion engines

*New laser system may lead to reduced auto emissions, enhanced fuel efficiency*

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### 14. Business Wire:

<http://www.businesswire.com/portal/site/home/>  
<http://www.businesswire.com/portal/site/home/events/?eventName=CLEO-2011>  
<http://www.businesswire.com/news/home/20110420005464/en/Laser-Sparks-Revolution-Internal-Combustion-Engines>



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#### CLEO:2011

April 20, 2011 09:00 AM Eastern Daylight Time

#### Laser Sparks Revolution in Internal Combustion Engines

*New laser system may lead to reduced auto emissions, enhanced fuel efficiency*

CLEO 2011

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**"Composite All-Ceramics,  
Passively Q-switched  
Nd:YAG/Cr:4-YAG Monolithic  
Micro-Laser with Two-Beam  
Output for Multi-Point Ignition"**

15. Science Codex:

[http://www.sciencecodex.com/laser\\_sparks\\_revolution\\_in\\_internal\\_combustion\\_engines](http://www.sciencecodex.com/laser_sparks_revolution_in_internal_combustion_engines)



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### Laser sparks revolution in internal combustion engines

posted on: april 20, 2011 - 4:00pm

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WASHINGTON, April 20—For more than 150 years, spark plugs have powered internal combustion engines. Automakers are now one step closer to being able to replace this long-standing technology with laser igniters, which will enable cleaner, more efficient, and more economical vehicles.

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Engines make NOx as a byproduct of combustion. If engines ran leaner – burnt more air and less fuel – they would produce significantly smaller NOx emissions.

16. Scienceray:

<http://scienceray.com/physics/laser-spark-in-internal-combustion-engines/>



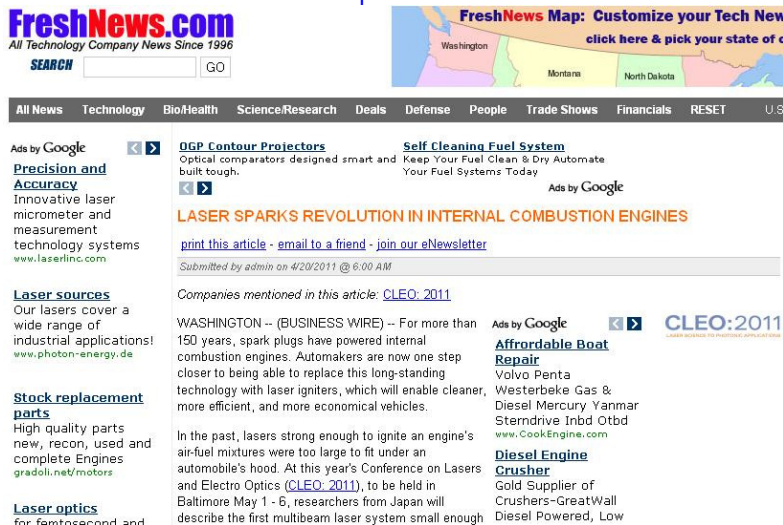
## Laser Spark in Internal Combustion Engines

More than one hundred and fifty years of burning candles brings the internal combustion engines. Machinery manufacturers took another new technology that will replace the lasting laser system burner. The technology means cleaner, more efficient and economical means of transportation.

In the past, lasers are strong enough that the engine had ignited the fuel-air mixture high to allow them to put the lid of the machine. This year, the Laser and Electro Optics Conference (Conference on Lasers and Electro Optics: CLEO), researchers will present a multipath laser system, which is small enough to be able to fit into the cylinder head. According to one author, Takunorio Tairi (Takunori Taira), it is that the new laser system is made of ceramic and can be inexpensively produced in large quantities. Taira has Takunori Japanese National Institute of Sciences (Japan's National Institutes of Natural Sciences).

17. Fresh News:

<http://www.freshnews.com/news/483107/laser-sparks-revolution-internal-combustion-engines>



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### LASER SPARKS REVOLUTION IN INTERNAL COMBUSTION ENGINES

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Submitted by admin on 4/20/2011 @ 6:00 AM

Companies mentioned in this article: [CLEO: 2011](#)

WASHINGTON -- (BUSINESS WIRE) -- For more than 150 years, spark plugs have powered internal combustion engines. Automakers are now one step closer to being able to replace this long-standing technology with laser igniters, which will enable cleaner, more efficient, and more economical vehicles.

In the past, lasers strong enough to ignite an engine's air-fuel mixtures were too large to fit under an automobile's hood. At this year's Conference on Lasers and Electro Optics (CLEO: 2011), to be held in Baltimore May 1 - 6, researchers from Japan will describe the first multibeam laser system small enough

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18. Science Blog:  
<http://scienceblog.com/44560/laser-sparks-revolution-in-internal-combustion-engines/>

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**Laser sparks revolution in internal combustion engines**

on APRIL 20, 2011

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19. Next Big Future:  
<http://nextbigfuture.com/2011/04/lasers-could-replace-spark-plugs-for.html>



Coverage of Science and Technology having high potential for disruption & Analysis of plans, policies and technology to enable radical improvements.

APRIL 20, 2011

**Lasers could replace spark plugs for cleaner and more efficient engines**

Spark plugs can ignite leaner fuel mixtures, but only by increasing spark energy. Unfortunately, these high voltages erode spark plug electrodes so fast, the solution is not economical. By contrast, lasers, which ignite the air-fuel mixture with concentrated optical energy, have no electrodes and are not affected.

Lasers also improve efficiency. Conventional spark plugs sit on top of the cylinder and only ignite the air-fuel mixture close to them. The relatively cold metal of nearby electrodes and cylinder walls absorbs heat from the explosion, quenching the flame front just as it starts to expand.

Lasers, Taira explains, can focus their beams directly into the center of the mixture. Without quenching, the flame front expands more symmetrically and up to three times faster than those produced by spark plugs.

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20. Morningstar:  
<http://news.morningstar.com/all/business-wire/20110420005464/laser-sparks-revolution-in-internal-combustion-engines.aspx>

**MORNINGSTAR**

Press Release: BusinessWire

**Laser Sparks Revolution in Internal Combustion Engines**

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For more than 150 years, spark plugs have powered internal combustion engines. Automakers are now one step closer to being able to replace this long-standing technology with laser igniters, which will enable cleaner, more efficient, and more economical vehicles.



## Lasers could replace spark plugs in cars

Wednesday, April 20, 2011 6:12 PM

April 20, 2011 (UPI NewsTrack) -- BALTIMORE, April 20 (UPI) -- After 150 years of spark ignition in internal combustion engines, spark plugs may someday be replaced by laser igniters, Japanese researchers say.

A switch to laser igniters would yield cleaner, more efficient and more economical vehicles, researchers say.



Previously, lasers strong enough to spark ignition of air-fuel mixtures in an engine were much too bulky to fit under a car's hood, Japanese researchers say they've developed the first laser system small enough to screw into an engine's cylinder head.

Their finding will be presented at the Conference on Laser and Electro Optics to be held in Baltimore in May, a release from the Optical Society of America said Wednesday.

21. iStock Analyst:

<http://www.istockanalyst.com/business/news/5077940/lasers-could-replace-spark-plugs-in-cars>

22. Click Green:

<http://www.clickgreen.org.uk/news/international-news/122179-lasers-to-replace-spark-plugs-and-create-greener-car-engines.html>

## Lasers to replace spark plugs and create greener car engines

by ClickGreen staff. Published Wed 20 Apr 2011 20:35

A new inexpensive laser system could replace spark plugs and lead to reduced auto emissions and enhanced fuel efficiency, according to its inventors.

For more than 150 years, spark plugs have powered internal combustion engines, but automakers are now one step closer to being able to replace this long-standing technology with laser igniters, which will enable cleaner, more efficient, and more economical vehicles.

In the past, lasers strong enough to ignite an engine's air-fuel mixtures were too large to fit under an automobile's hood. At this year's Conference on Lasers and Electro Optics (CLEO: 2011), to be held in Baltimore May 1 - 6, researchers from Japan will describe the first multibeam laser system small enough to screw into an engine's cylinder head.

Equally significant, the new laser system is made from ceramics, and could be produced inexpensively in large volumes, according to one of the presentation's authors, Takunori Taira of Japan's National Institutes of Natural Sciences.

According to Taira, conventional spark plugs pose a barrier to improving fuel economy and reducing emissions of nitrogen oxides (NOx), a key component of smog.



23. MRO magazine:

<http://www.mromagazine.com/press-releases/story.aspx?id=4636493>



PRESS RELEASES 4/20/2011 9:00:00 AM

## Laser Sparks Revolution in Internal Combustion Engines

WASHINGTON

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## Laser-Powered Spark Plugs Closer to Reality, Toyota Interested

21 April 2011, 15:53 BST



Conventional gasoline engine makers may one day replace spark plugs with lasers, as Japanese researchers have designed and prototyped laser devices that are powerful enough to ignite the fuel and small enough to fit into the engine cylinder head (9 millimeters in diameter and 11 millimeters in length).

So far, lasers having that much power have been extremely large, and the possibility of embedding them under a car's hood was out of the question. Trials that involved sending the laser through optical fibers failed, because the heat melted them. The new multibeam laser system, though, is made from ceramics, which are highly suited to high temperatures.

24. Green Economy:

<http://uk.ibtimes.com/articles/20110421/laser-powered-spark-plugs-closer-reality-toyota-interested.htm>

## Science News

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### Lasers could replace spark plugs in cars

Published: April 20, 2011 at 5:19 PM

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BALTIMORE, April 20 (UPI) -- After 150 years of sparking ignition in internal combustion engines, spark plugs may someday be replaced by laser igniters, Japanese researchers say.

A switch to laser igniters would yield cleaner, more efficient and more economical vehicles, they say.

Previously, lasers strong enough to spark the ignition of air-fuel mixtures in an engine were much too bulky to fit under a car's hood, but Japanese researchers say they've developed the first laser system small enough to screw into an engine's cylinder head.

Their finding will be presented at the Conference on Laser and Electro Optics to be held in Baltimore in May, a release from the Optical Society of America said Wednesday.



25. UPI:

[http://www.upi.com/Science\\_News/2011/04/20/Lasers-could-replace-spark-plugs-in-cars/UPI-41831303334362/](http://www.upi.com/Science_News/2011/04/20/Lasers-could-replace-spark-plugs-in-cars/UPI-41831303334362/)

26. News Blaze:

<http://newsblaze.com/story/2011042006013300003.bw/topstory.html>

### Laser Sparks Revolution in Internal Combustion Engines



WASHINGTON - (BUSINESS WIRE) - For more than 150 years, spark plugs have powered internal combustion engines. Automakers are now one step closer to being able to replace this long-standing technology with laser igniters, which will enable cleaner, more efficient, and more economical vehicles.



In the past, lasers strong enough to ignite an engine's air-fuel mixtures were too large to fit under an automobile's hood. At this year's Conference on Lasers and Electro Optics (CLEO: 2011), to be held in Baltimore May 1 - 6, researchers from Japan will describe the first multibeam laser system small enough to screw into an engine's cylinder head.

Equally significant, the new laser system is made from ceramics, and could be produced inexpensively in large volumes, according to one of the presentation's authors, Takunori Taira of Japan's National Institutes of Natural Sciences.



According to Taira, conventional spark plugs pose a barrier to improving fuel economy and reducing emissions of nitrogen oxides (NOx), a key component of smog.

**Lasers could replace spark plugs in cars**

Apr 20, 2011

SCIENCE & TECHNOLOGY NEWS | SCIENCE & TECHNOLOGY | NEWS

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Takunori Taira of Japan's National Institutes of Natural Sciences, one of the presentation's authors, says the new laser system is made from ceramics and could be produced inexpensively in large volumes.

The lasers promise less pollution and greater fuel efficiency because they will allow engines to run cleaner, burning more air and less fuel, the researchers say.

This would create less nitrogen oxide emissions, a component of smog, they say.

27. Arca Max:  
<https://www.arcamax.com/technology/technews/s-872574>



Monday, April 25, 2011

**Soon, laser igniters may replace spark plugs in car engines**

Category » **Business** Posted On Thursday, April 21, 2011

Agencies

Washington, April 21

Automakers are now one step closer to replace more than 150-year-old spark plugs with laser igniters, which promise cleaner, more efficient, and more economical vehicles.

In the past, lasers strong enough to ignite an engine's air-fuel mixtures were too large to fit under an automobile's hood.

Now, researchers from Japan have developed the first multibeam laser system small enough to screw into an engine's cylinder head.

The new laser system is made from ceramics, and could be produced inexpensively in large volumes, said Takunori Taira of Japan's National Institutes of Natural Sciences and an author of the study.

According to him, conventional spark plugs pose a barrier to improving fuel economy and reducing emissions of nitrogen oxides (NOx), a key component of smog.

The team heats the powders to fuse them into optically transparent solids and embeds metal ions in them to tune their properties.

They built its laser from two yttrium-aluminum-gallium (YAG) segments, one doped with neodymium, the other with chromium. They bonded the two sections together to form a powerful laser only 9 millimeters in diameter and 11 millimeters long (a bit less than half an inch).

The composite generates two laser beams that can ignite fuel in two separate locations at the same time. This would produce a flame wall that grows faster and more uniformly than one lit by a single laser.

The laser is not strong enough to light the leanest fuel mixtures with a single pulse. By using several 800-picosecond-long pulses, however, they can inject enough energy to ignite the mixture completely.

He has already tested the new dual-beam laser at 100 Hz.

The laser-ignition system, although highly promising, is not yet being installed into actual automobiles made in a factory.

The study will be presented at this year's Conference on Lasers and Electro Optics to be held in Baltimore May 1 - 6.

28. Central Chronicle:  
<http://www.centralchronicle.com/vie/wnews.asp?articleID=59789>

**Laser Ignition System To Replace Spark Plugs ?**

In this year's Conference on Lasers and Electro Optics (CLEO: 2011), to be held in Baltimore on May 1-6, researchers from Japan will describe the first multibeam laser system small enough to screw into an engine's cylinder head.

The new laser ignition system is made from ceramics, and could be produced inexpensively in large volumes, according to Takunori Taira of Japan's National Institutes of Natural Sciences.

Spark plugs can ignite leaner fuel mixtures, but only by increasing spark energy. Unfortunately, these high voltages erode spark plug electrodes so fast, the solution is not economical. By contrast, lasers, which ignite the air-fuel mixture with concentrated optical energy, have no electrodes and are not affected.

Lasers also improve efficiency. Conventional spark plugs sit on top of the cylinder and only ignite the air-fuel mixture close to them. The relatively cold metal of nearby electrodes and cylinder walls absorbs heat from the explosion, quenching the flame front just as it starts to expand.

Lasers, Taira explains, can focus their beams directly into the center of the mixture. Without quenching, the flame front expands more symmetrically and up to three times faster than those produced by spark-plugs.



29. Ideas Galore:  
<http://affleap.com/laser-ignition-system-to-replace-spark-plugs/>

BREAKING NEWS

**Spark plugs may be replaced by lasers**

April 21, 2011 - [news4its@ropl.com](mailto:news4its@ropl.com)

For more than 150 years, spark plugs have powered internal combustion engines. Automakers are now one step closer to being able to replace this long-standing technology with laser igniters, which will enable cleaner, more efficient, and more economical vehicles.

In the past, lasers strong enough to ignite an engine's air-fuel mixtures were too large to fit in a vehicle's engine compartment. At this year's Conference on Lasers and Electro Optics (CLEO: 2011) - [www.cleoconference.org](http://www.cleoconference.org) - being held in Baltimore, USA from 1-6 May, researchers from Japan will describe the first multibeam laser system small enough to screw into an engine's cylinder head.

Equally significant, the new laser system is made from ceramics, and could be produced inexpensively in large volumes, according to one of the presentation's authors, Takunori Taira of Japan's National Institutes of Natural Sciences.

According to Taira, conventional spark plugs pose a barrier to improving fuel economy and reducing emissions of nitrogen oxides (NOx), a key component of smog. If engines ran leaner – burnt more air and less fuel – they would produce significantly smaller NOx emissions.

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30. Intertraffic:  
[http://www.intertraffic.com/news/breakingnews\\_detail.asp?newsid=7757](http://www.intertraffic.com/news/breakingnews_detail.asp?newsid=7757)

innovations report

**Laser sparks revolution in internal combustion engines**

21.04.2011 » nächste Meldung »

**New laser system may lead to reduced auto emissions, enhanced fuel efficiency**

For more than 150 years, spark plugs have powered internal combustion engines. Automakers are now one step closer to being able to replace this long-standing technology with laser igniters, which will enable cleaner, more efficient, and more economical vehicles.

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According to Taira, conventional spark plugs pose a barrier to improving fuel economy and reducing emissions of nitrogen oxides (NOx), a key component of smog.

31. Innovations Report:  
[http://www.innovations-report.de/html/berichte/verfahrenstechnologie/laser\\_sparks\\_revolution\\_internal\\_combustion\\_engines\\_174177.html](http://www.innovations-report.de/html/berichte/verfahrenstechnologie/laser_sparks_revolution_internal_combustion_engines_174177.html)

trading-house.net

**Laser Sparks Revolution in Internal Combustion Engines**

Mittwoch, 20.04.2011 | 16:02 Uhr

**For more than 150 years, spark plugs have powered internal combustion engines. Automakers are now one step closer to being able to replace this long-standing technology with laser igniters, which will enable cleaner, more efficient, and more economical vehicles.**

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Spark plugs work by sending small, high-voltage electrical sparks across a gap between two metal electrodes. The spark ignites the air-fuel mixture in the engine's cylinder, producing a controlled explosion that forces the piston down to the bottom of the cylinder, generating the horsepower needed to move the vehicle.

Engines make NOx as a byproduct of combustion. If engines ran leaner? burnt more air and less fuel? they would produce significantly smaller NOx emissions.

Spark plugs can ignite leaner fuel mixtures, but only by increasing spark energy. Unfortunately, these high voltages erode spark plug electrodes so fast, the solution is not economical. By contrast, lasers, which ignite the air-fuel mixture with concentrated optical energy, have no electrodes and are not affected.

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<http://www.trading-house.net/news/wirtschaft/laser-sparks-revolution-in-internal-combustion-engines-22085875.html>

33. India Talkies:  
<http://www.indiatalkies.com/2011/04/laser-igniters-replace-spark-plugs-car-engines.html>



### Soon, laser igniters may replace spark plugs in car engines

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Washington, April 21: Automakers are now one step closer to replace more than 150-year-old [spark plugs](#) with laser [igniters](#), which promise cleaner, more efficient, and more [economical](#) vehicles.

In the past, lasers strong enough to ignite an engine's air-fuel [mixtures](#) were too large [to fit](#) under an automobile's hood.

Now, researchers from Japan have developed the first multibeam laser system small enough to screw into an engine's [cylinder head](#).

The new laser system is made from [ceramics](#), and could be produced inexpensively in large volumes, said Takunori Taira of Japan's National Institutes of Natural Sciences and an author of the study.

According to him, conventional spark plugs pose a barrier to [improving fuel economy](#) and [reducing emissions](#) of nitrogen oxides (NOx), a key component of smog.



34. Korea IT Times:  
<http://www.koreaitimes.com/story/14301/laser-sparks-revolution-internal-combustion-engines>



### Laser Sparks Revolution in Internal Combustion Engines

Thursday, April 21st, 2011  
KOREA IT TIMES



Firing a laser beam through the optical spark plug produces a bigger and more intense spark (top) than a conventional spark plug connected to a high-tension lead (bottom)

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35. The X-Journals:  
<http://x-journals.com/2011/laser-sparks-revolution-in-internal-combustion-engines/>



### Laser Sparks Revolution In Internal Combustion Engines

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36. Mail Online: <http://www.dailymail.co.uk/sciencetech/article-1380460/Lasers-replace-spark-plugs-make-engines-greener.html>

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## Lasers could replace spark plugs to make engines greener, believe scientists

By DAILY MAIL REPORTER  
Last updated at 12:01 PM on 28th April 2011

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- **Romanian-Japanese team in talks to commercialise product which could revolutionise car industry**

Lasers could soon replace spark plugs in cars to make engines greener, according to researchers.

Experts from from Romania and Japan will reveal their findings - that inexpensive lasers could ignite the fuel-air mixture in combustion engines - at the Conference on Lasers and Electro-Optics in Baltimore next month.

37. Engineers EDGE (25.04.2011):  
[http://www.engineersedge.com/engineering/Engineers\\_Edge/replacing\\_the\\_spark\\_plug\\_with\\_a\\_laser\\_igniter\\_9423.htm](http://www.engineersedge.com/engineering/Engineers_Edge/replacing_the_spark_plug_with_a_laser_igniter_9423.htm)



### Engineering & Technology News | Industrial News Buzz

#### Replacing the spark plug with a laser igniter

Apr 25, 2011 - For more than a century, spark plugs have been the key component in reciprocating engines to initiate combustion. Engine makers are now one step closer to being able to replace this long-standing technology with laser-igniters, which will enable cleaner, more efficient, and more economical vehicles



Engineers Edge - In the past, lasers strong enough to ignite an engine's air-fuel mixtures were too large to fit under an automobile's hood. At this year's Conference on Lasers and Electro Optics (CLEO: 2011), to be held in Baltimore May 1 - 6, researchers from Japan will describe the first multibeam laser system small enough to screw into an engine's cylinder head.

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**"When the Smart Grid... Meets the Smart Home"**  
Click here to read the full report at [www.FuturistSpeaker.com](http://www.FuturistSpeaker.com)

April 26th, 2011 at 11:11 am

**Lasers Could Replace Spark Plugs in Your Next Car**  
In: Science & Technology News



#### Lasers could replace spark plugs.

Spark plugs have powered internal combustion engines for more than 150 years. Car manufacturers are one step closer to being able to replace this long-standing technology with laser igniters. The laser igniters will enable cleaner, more efficient, and more economical vehicles.

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38. Impact Lab:  
<http://www.impactlab.net/2011/04/26/lasers-could-replace-spark-plugs-in-your-next-car/>



39. GMInsideNews.com:  
<http://www.gminsidenews.com/forums/f12/laser-sparks-revolution-internal-combustion-engines-102450/>

Laser Sparks Revolution in Internal Combustion Engines

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SCIENTIADAILY  
Apr. 21, 2011

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40. The Times of India:  
<http://timesofindia.indiatimes.com/topic/search?q=Conference%20on%20Lasers%20and%20Electro-Optics>

## THE TIMES OF INDIA

DISCOVERY NEWS 1 DAY AGO

### Car Engine Powered by Lasers



Taira's group is working on a three-beam laser that they hope will be even faster than their current one. They will be presenting their laser research next week at the Conference on Lasers and Electro Optics in Baltimore. Greg Quarles is a physicist as...

[FULL ARTICLE AT DISCOVERY NEWS](#)

41. Green Car Congress: <http://www.greencarcongress.com/2011/04/laser-2010420.html>

42. Ulitzer: <http://www.ulitzer.com/node/1800646>

43. CRAZY ENGINEERS: <http://www.crazyengineers.com/laser-igniter-to-replace-the-good-old-spark-plug-163/>

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<http://tangledwing.wordpress.com/2011/04/22/cape-cod-salt-marsh-wallpaper-laser-spark-plugs-could-be-revolutionary/>

45. Transportation News and Technology:  
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47. Ad Astra: [http://www.ad-astra.ro/posts/view\\_post.php?post\\_id=1698&lang=ro](http://www.ad-astra.ro/posts/view_post.php?post_id=1698&lang=ro)

48. StockMarketsReview.com: <http://stockmarketsreview.com/pressrelease/2011/04/24/laser-sparks-revolution-in-internal-combustion-engines/>

49. Pr-inside.com: <http://www.pr-inside.com/laser-sparks-revolution-in-internal-%3Cb%3Ecombustion%3C/b%3E-r2548738.htm>

50. FirstScience News: [http://www.firstscience.com/home/news/breaking-news-all-topics/laser-sparks-revolution-in-internal-combustion-engines-page-2-1\\_104212.html](http://www.firstscience.com/home/news/breaking-news-all-topics/laser-sparks-revolution-in-internal-combustion-engines-page-2-1_104212.html)

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53. Epicos.com:  
<http://www.epicos.com/Portal/Main/Home/Pages/ItemDetails.aspx?wlaopCxX2Y877v%2Fe%2F%2B2h%2FOhLYhRZmrfrib9ubm7l6hQYhqqjDmYLcRcJUWVH%2FNvt>

54. Bloombergs: <http://www.bloomberg.com/apps/news?pid=conewsstory&tkr=DNO:GR&sid=ahMJMDRDxc.I>

55. Ameritrade:	<a href="http://research.tdameritrade.com/public/markets/news/story.asp?docKey=100-110b0937-1&amp;searchCategory=markets">http://research.tdameritrade.com/public/markets/news/story.asp?docKey=100-110b0937-1&amp;searchCategory=markets</a>
56. Moviemazaa.com:	<a href="http://www.moviemazaa.com/node/704519">http://www.moviemazaa.com/node/704519</a>
57. WBPonline:	<a href="http://www.wbponline.com/content/view/677561">http://www.wbponline.com/content/view/677561</a>
58. Laboratory & Regulatory Retriever:	<a href="http://www.regulatoryretriever.com/about-2/general-science/">http://www.regulatoryretriever.com/about-2/general-science/</a>
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60. Press Trust:	<a href="http://www.presstrust.com/node/704519">http://www.presstrust.com/node/704519</a>
61. Science Daily:	<a href="http://www.sciencedaily.com/releases/2011/04/110420125502.htm">http://www.sciencedaily.com/releases/2011/04/110420125502.htm</a>
62. Analysis Prognosis News:	<a href="http://anpron.eu/?p=937">http://anpron.eu/?p=937</a>
63. Final Gear:	<a href="http://forums.finalgear.com/automotive-news/laser-ignition-49242/">http://forums.finalgear.com/automotive-news/laser-ignition-49242/</a>
64.	<a href="http://www.mx5atlanta.com/forums/showthread.php?t=12155">http://www.mx5atlanta.com/forums/showthread.php?t=12155</a>
65.	<a href="http://www.ashtabularacing.com/forums/showthread.php?t=12386">http://www.ashtabularacing.com/forums/showthread.php?t=12386</a>
66.	<a href="http://www.nceuro.org/forums/viewtopic.php?t=16385&amp;sid=fc2ddb463758573e9f180e5a1670641a">http://www.nceuro.org/forums/viewtopic.php?t=16385&amp;sid=fc2ddb463758573e9f180e5a1670641a</a>
67. Ad Hoc News:	<a href="http://www.ad-hoc-news.de/laser-sparks-revolution-in-internal-combustion-engines--/de/News/22085875">http://www.ad-hoc-news.de/laser-sparks-revolution-in-internal-combustion-engines--/de/News/22085875</a>
68. Investments Innovations Business:	<a href="http://eng.spb-venchur.ru/news/7309.htm">http://eng.spb-venchur.ru/news/7309.htm</a>
69. Deshad:	<a href="http://uvdbdtican.myblog.it/archive/2011/04/29/lasers-could-replace-spark-plugs.html">http://uvdbdtican.myblog.it/archive/2011/04/29/lasers-could-replace-spark-plugs.html</a>
70.	<a href="http://www.aussiestreetcars.com/showthread.php?t=1178">http://www.aussiestreetcars.com/showthread.php?t=1178</a>
71. Electronics Bulletin:	<a href="http://www.electronicbulletin.com/research/Laser_sparks_revolution_in_internal_combustion_engines.asp">http://www.electronicbulletin.com/research/Laser_sparks_revolution_in_internal_combustion_engines.asp</a>
72.	<a href="http://howtosparkplugs.com/tag/replace/">http://howtosparkplugs.com/tag/replace/</a>
73.	<a href="http://www.yarisworld.com/forums/showthread.php?t=34425">http://www.yarisworld.com/forums/showthread.php?t=34425</a>
74. Retro Ride:	<a href="http://retrorides.proboards.com/index.cgi?board=general&amp;action=display&amp;thread=102470&amp;page=1">http://retrorides.proboards.com/index.cgi?board=general&amp;action=display&amp;thread=102470&amp;page=1</a>
75. Free Republic:	<a href="http://www.freerepublic.com/focus/f-chat/2708044/posts">http://www.freerepublic.com/focus/f-chat/2708044/posts</a>
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## Japanese researchers devise laser 'spark plugs'

By David Worthington | April 25, 2011, 7:42 PM PDT

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<http://www.smartplanet.com/blog/intelligent-energy/japanese-researchers-devise-laser-8217spark-plugs-8217/5797>

A new laser system invented by Japanese researchers could displace the venerable design of spark plugs, which has stood virtually unchanged for the past 150 years.

An inter-university team of researchers at Japan's National Institutes of Natural Sciences, or (NINS), will be demonstrating a multi-beam laser system at the Conference on Lasers and Electro-Optics next week in Baltimore.

The system promises to improve fuel economy and reduce emissions of smog causing nitrogen oxides. It ignites an engine's air-fuel mixture more efficiently and further down within the cylinder, burning more air and less fuel.



Photo credit: Takunori Taira, National Institutes of Natural Sciences, Japan.

## NEW ENERGY AND FUEL

APR  
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### Spark That Engine With A Laser

April 26, 2011 | 3 Comments

After more than 150 years engine manufacturers are one step closer to being able to replace spark plugs in internal combustion engines with laser igniters. Laser igniters are reputed to enable cleaner, more efficient, and more economical vehicles.



Laser Igniter and Spark Plug Comparison. Click image for more info.

So far lasers strong enough to ignite an engine's air-fuel mixtures were too large to fit under an automobile's hood. At the upcoming Conference on Lasers and Electro Optics in Baltimore on May 1-6, researchers from Japan will describe the first multibeam laser system small enough to screw into an engine's cylinder head.

Takunori Taira of Japan's National Institutes of Natural Sciences, one of the presentation's authors expects the new laser system will be made from ceramics, and could be produced inexpensively in large volumes.

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### Technology Review

#### Laser ignition may replace spark plugs

Published by admin on 3rd May 2011 Filed Under Hi-Tech

Japanese researchers are suggesting at a science meeting that laser spark plugs might increase the fuel efficiency of your future car.



"During the last years, extensive research has been performed on laser-induced ignition of air-fuel mixtures in internal combustion engines," begins a study to be presented at an upcoming laser optics meeting in Baltimore, by Takunori Taira of Japan's National Institutes of Natural Sciences. "The experiments revealed that laser-induced ignition offers significant advantages over a conventional spark-ignition system, such as higher probability to ignite leaner mixtures, reduction of erosion effects, increases of engine efficiency, or shorter combustion time."

At the meeting, Taira will describe a ceramic solid-state laser that could take the place of the spark plug. "Timing – quick combustion – is very important. The more precise the timing, the more efficient the combustion and the better the fuel economy," he says, in a statement. Adding precise amounts of neodymium to yttrium aluminum garnet laser crystal deliver spark performance, his team reports.

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