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These brief summaries are drawn from several sources and are issued throughout the year. For more information please contact the source given at the end of each article, or contact the editor at the address given on the back.

Plasma Techniques Used in New Pasteurization Process

A small group of fusion researchers at the Princeton Plasma Physics Laboratory (PPPL) is focusing its attention on an innovative pasteurization process through a collaboration with the U.S. Department of Agriculture (USDA).

PPPL is funded by the U.S. Department of Energy and managed by Princeton University. Its goal is a collaborative national center for plasma science and technology leading to an attractive fusion energy source.

USDA and the PPPL signed an interagency agreement to develop jointly new pasteurization methods that use radio-frequency (rf) waves and microwave heating.

The $120,000 agreement between the two federally funded agencies originated after researchers at the USDA's Eastern Regional Resource Center (ERRC) in Philadelphia became aware of the value of rf radiation while exploring improved methods for pasteurization.

These heating techniques -- also used to warm plasma in a fusion device -- are being tested for pasteurizing raw liquid food such as eggs, fruit juices, and milk. Initial results and subsequent evaluation of micro-organisms introduced into liquid foods indicate that rf radiation is a potentially effective means of pasteurization.

The ERRC is working with PPPL because of the Laboratory's extensive experience in the application of rf and microwave radiation to the study of plasmas. PPPL's expertise includes the measuring of rf parameters, instrumentation, the design and fabrication of antennas, and the safe handling of these components.

The agreement between ERRC and PPPL supports memorandum of understanding between Secretary of Agriculture Dan Glickman and former Secretary of Energy Hazel O'Leary to use one federal agency's technologies to benefit research at other federal agencies.

"This is another example of applying our fusion and plasma science capabilities to an area that benefits the U.S. public," said PPPL Technology Transfer Head Lewis Meixler.

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Plasma Thrusters for Deep Space Transport

Although terms like “variable specific impulse magnetoplasma rocket” and “lithium fed Lorentz force accelerator propulsion" sound as if they belong in science fiction, their application is becoming science fact. A “mini-conference” within a Pittsburgh meeting drew engineers and researchers from around the world to discuss the latest advances in the theory and design of plasma-based propulsion systems for deep space travel.

One limiting factor in deep space missions is the relatively limited exhaust velocities of chemical rockets. This prevents extended space travel and requires large initial fuel masses.

NASA and others are developing alternatives to chemical rockets for space travel. Among the most promising is plasma-based propulsion.

In most cases, plasma-based propulsion utilizes a magnetically guided plasma accelerated out of the back of the engine to provide thrust.

At this “conference within a conference,” progress was made on several space propulsion concepts. These methods exploit the high velocities and relative energy efficiencies of plasma propulsion systems.

For more information contact Joseph Ashkenazy, Propulsion Physics Lab, Soreq NRC, Yavne 81800, Israel, Tel: 972-8-43454
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Cleaning Up the Air

Researchers at the University of Tennessee working with industry are applying plasma techniques to develop portable equipment to remove pollutants from the environment.

These plasma techniques are intended to remove bacterial, chemical, and particular pollutants from surfaces, water, and the air. The process uses electrical discharge techniques.

An electrostatic charge method is also being developed to enhance air filtration. Members of industry are preparing these various devices for field testing.

In other waste remediation research, a high power RF (radio frequency) plasma device is being used to study waste in gas streams.

Researchers at UCLA have shown that the plasma conditions in the ionosphere can be modified by ground based solid state lasers. This raises the intriguing possibility that science and technology could develop laser-based techniques to modify the conditions in the troposphere, in particular, to remove chlorofluorocarbons (CFCs).

This could potentially help reduce the problem of ozone depletion in the atmosphere caused by CFCs.

For more information contact V. Stefan at Tesla Laboratories, Inc. La Jolla, California 92038-2946.

Plasma Beams 'Kill' Diesel Exhaust

In the past, Professor Martin Gundersen from the University of Southern California helped to develop electron plasma beams for the Department of Defense's 'Star Wars Program'. With the end of the Cold War, he plans to use the technique for a more peaceful application: fighting diesel exhaust.

The device, called a "plasma reactor," sends high-voltage pulses that create an ion plasma and convert hazardous nitrogen oxides into harmless water vapor and air. Diesel exhaust is one of the largest and most hazardous sources of air pollution in California.

In 1998, federal regulation will reduce the maximum level of nitrogen oxides by 20 percent, making it difficult for existing technologies to keep up. Therefore, the new device could play a key role in ensuring low emission levels.

Part of the funding for Gunderson's research comes from the Navy, since it hopes to reduce the pollution of diesel-powered warships.

The plasma reactor has been successfully tested with a Volkswagen Rabbit and could also be used in trucks, buses and trains. It can be installed in existing engines without any modifications. Because there are roughly 5 million heavy-duty trucks on American highways, the potential market for the new device could be more than 5 billion dollars.

For further information contact Prof. Martin Gundersen, USC (213) 740-4396, email: gundy@usc.edu.

Plasma Science Articles Needed

If you are aware of plasma science related research or applications which you think are worthy of being highlighted in the CPS Plasma Page, please send or e-mail a three to five paragraph description to: Paul Rivenberg, Editor, CPS Plasma Page, The MIT Plasma Science and Fusion Center, Room NW16-284, 77 Massachusetts Ave., Cambridge, MA 02139-4307; e-mail: rivenberg@psfc.mit. edu. Be sure to include in the description the funding source for the research and a contact name for more information.