UCLA researchers create nuclear fusion in lab

May 1 2005

Attempts to create controlled nuclear fusion - the process that powers stars - have been a source of continuing controversy. Scientists have struggled for decades to effectively harness nuclear fusion in hot plasma for energy generation - potentially a cleaner alternative to the current nuclear-fission reactors - but have so far been unsuccessful at turning this into an economically viable process.
Meanwhile, claims of cheap "bench-top" fusion by electrolysis of heavy water ("cold fusion") and by sonic bubble-formation in water (sonoluminescence) have been greeted with skepticism, and have not been successfully reproduced.
In this week's *Nature*, Brian Naranjo and colleagues report a new kind of "bench-top" nuclear fusion, based on measurements that seem considerably more convincing than these previous claims.

The publication was written by a UCLA team that includes Brian Naranjo, a graduate student in physics; James Gimzewski, professor of chemistry; and Seth Putterman, professor of physics. Gimzewski and Putterman are members of the California NanoSystems Institute at UCLA.

The team initiates fusion of deuterium — heavy hydrogen, the fuel used in conventional plasma fusion research — using the strong electric field generated in a pyroelectric crystal. Such materials produce electric fields when heated, and the researchers concentrated this field at the tip of a tungsten needle connected to the crystal. In an atmosphere of deuterium gas, this generates positively charged deuteron ions and accelerates them

to high energy in a beam.

When this beam strikes a target of erbium deuteride, Naranjo and colleagues detect neutrons coming from the target with precisely the energy expected if they were generated by the nuclear fusion of two deuterium nuclei. The neutron emission is 400 times stronger than the usual background level.

The researchers say that this method of producing nuclear fusion won't be useful for normal power generation, but it might find applications in the generation of neutron beams for research purposes, and perhaps as a propulsion mechanism for miniature spacecraft.

Publication: The Journal Nature, April 28, 2005 "Observation of Nuclear Fusion Driven by a Pyroelectric Crystal"

For more information about the project, visit rodan.physics.ucla.edu/pyrofusion

Source: UCLA