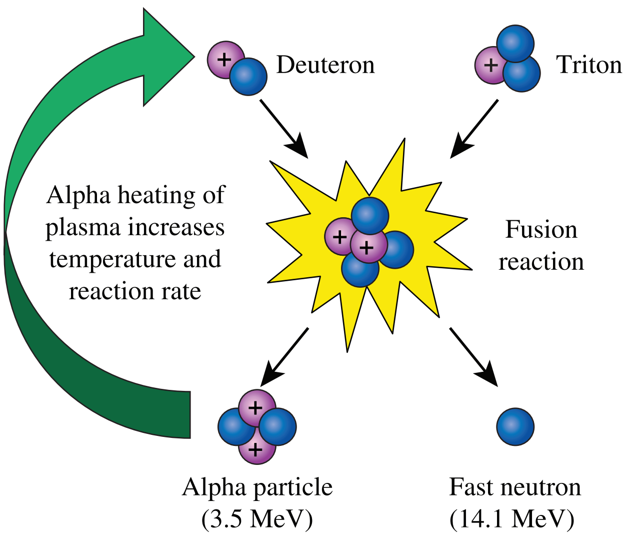
About the Cover:

The photo on the cover shows Prof. Riccardo Betti (front) with University of Rochester students Jack Woo, Alison Christopherson, Joel Howard, and Arijit Bose (left to right). The University of Rochester team, together with collaborators at Lawrence Livermore National Laboratory and the University of Madrid, have developed a technique to measure the level of alpha-particle heating and to assess the onset of the burning-plasma regime in inertial fusion implosion experiments. Fusion alphas are produced in the fusion reactions of the thermonuclear fuel deuterium and tritium (DT) with an energy of 3.5 MeV and slow down through collisions with plasma electrons. The alpha-heated electrons transfer part of their energy to the D and T ions, thereby increasing the fusion reaction rate. The burning-plasma state is achieved when the alpha heating exceeds the external input energy to the thermonuclear fuel. Assessing the degree to which fusion alpha particles contribute to the plasma heating is essential to understanding the onset of the thermal runaway process called "ignition." Thermonuclear ignition is the most fundamental process at the heart of controlled nuclear fusion.



The image at the left shows a diagram of the thermal feedback process called alpha heating. If a thermonuclear plasma with deuterium (D) and tritium (T) is sufficiently hot and dense, then the D and T fuse to create one alpha particle and one neutron. The fast neutron escapes while the alpha particle deposits its energy back into the plasma, heating it more. As the reaction rate increases, the alpha-heating rate increases, which in turn increases the reaction rate. This thermal instability is the mechanism leading to high-energy gains in thermonuclear fusion schemes.

The work described in this volume includes current research at the Laboratory for Laser Energetics, which is supported by New York State Energy Research and Development Authority, the University of Rochester, the U.S. Department of Energy Office of Inertial Confinement Fusion under Cooperative Agreement No. DE-NA0001944, and other agencies.

For questions or comments, contact Dustin Froula, Editor, Laboratory for Laser Energetics, 250 East River Road, Rochester, NY 14623-1299, (585) 273-3686.

Worldwide-Web Home Page: http://www.lle.rochester.edu/
(Color online)

Printed in the United States of America
Available from
National Technical Information Services
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
www.ntis.gov