Intense solid-state nuclear fusion in highly deuterated pychnodeuterium-lumps

Yoshiaki ARATA and Yue Chang ZHANG

Cooperation Research Center for Science and Technology, Osaka University
Yamadaoka 2-1, Suita, Osaka 565-0871, Japan

As widely known, the fuel in the thermonuclear fusion is “gaseous deuterium’. In this article, however, we demonstrate a new concept of “solid deuterium nuclear fusion”, where “solid-state deuterium” (or “metallic deuterium”) locally solidified with ultrahigh density deuterium-lumps (“pycnodeuterium-lumps”) within metals are used as the fuel. This reaction was caused easily within the highly deuterated special crystal lattice using a stimulation energy such as powerful high energy density beams which have been practically used in industry (for instance, in welding process and/or other material processing). A lot of ^{4}He (10 ^{5} ppm) was produced with an extremely high rate of 17% ^{4}He against deuterium concentration using a powerful welding process for only 10 sec operation. On the contrary, in usual balk metals (even bulk Pd), the nuclear fusion was never observed, because it was impossible to form “pycnodeuterium-lumps” due to the bulk Pd property which could not contain beyond 100% deuterium concentration (practically about 80% as well known). It is concluded that “solid deuterium” is by far the excellent fuel against the “gaseous deuterium” in the thermonuclear fusion and characteristics of “solid deuterium nuclear fusion reactor” is described based on the above events, although it is small in size but provides excellent practical applicability.