

Abstract Submitted  
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**Condensed Matter Deuterium Cluster Target for Study of Pycnonuclear Reactions** XIAOLING YANG, MILEY GEORGE, University of Illinois at Urbana-Champaign — Fusion reactions have two main classes: thermonuclear and the pycnonuclear. Thermonuclear fusion occurs in low density high temperature plasmas, and is very sensitive to the ion temperature due to Columbic repulsion effects. As the density increases, the Columbic potential barrier is depressed by increased electron screening, allowing fusion at lower temperatures. This type of nuclear reaction is termed a pycnonuclear fusion and is the basis for astrophysical fusion. Ichimarua [1] proposed a laboratory study of this process using explosive mechanical compression of H/D to metallic densities, which would be extremely difficult to implement. Instead, our recent research suggests that metallic-like H/D “clusters” can be formed in dislocation loops of thin Palladium foils through electrochemical processes. [2] If this technique is used as a laser compression target, the compressed cluster density would allow study of pycnonuclear reactions. This provides a means of studying astrophysical fusion process, and could also lead to an important non-cryogenic ICF target. [2]

[1] S. Ichimarua, H. Kitamura. Phys. Plasmas, 6, 2649 (1999)

[2] G. Miley and X. Yang, Deuterium Cluster Target for Ultra-High Density, 18TH TOFE, San Francisco, CA Sep. 28 – Oct. 2, 2008

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