On the energy gain enhancement of DT+D\textsuperscript{3}He fuel configuration in nuclear fusion reactor driven by heavy ion beams

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Abstract

It is expected that advanced fuels be employed in the second generation of nuclear fusion reactors. Theoretical calculations show that in such a fuel, a high plasma temperature about 100 keV is a requisite for reaction rate improvement of nuclear fusion. However, creating such a temporal condition requires a more powerful driver than we have today. Here, introducing an optimal fuel configuration consisting of DT and D\textsuperscript{3}He layers, suitable for inertial confinement fusion reactors and driven by heavy ion beams, the optimal energy gain conditions have been simulated and derived for 1.3 MJ system. It was found that, in this new fuel configuration, the ideal energy gain, is 22 percent more comparing with energy gain in corresponding single DT fuel layer. Moreover, the inner DT fuel layer contributed as an ignition trigger, while the outer D\textsuperscript{3}He fuel acts as particle and radiation shielding as well as fuel layer.

Keywords: nuclear fusion reactor, heavy ion beam, inertial confinement fusion, DT+D\textsuperscript{3}He fuel configuration, high energy gain

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