

Abstract Submitted
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An Idealized Scenario for Energy Generation by Nuclear Fusion¹

DAVID W. KRAFT, ISSA DABABNEH, University of Bridgeport — We study nuclear fusion processes in a deuteron plasma under a combination of conditions such that, for a given energy input, a maximum energy output can be attained. Specifically we consider fusion processes initiated by the rapid adiabatic compression by a piston of a deuteron plasma contained in a well-insulated chamber. To exploit the n^2 factor in the fusion reaction rate, we consider one mole of plasma which, at ambient temperature and pressure, provides a particle density of $\sim 10^{19} \text{ cm}^{-3}$. Reaction rates are enhanced by the application of magnetic and electric fields to reduce the degrees of freedom of the plasma, thereby lowering its heat capacity and producing a higher temperature increase for a given energy input. Computations show that the combination of adiabatic operation, high particle density and reduced degrees of freedom can result in appreciable fusion rates at temperatures lower than those in magnetic confinement experiments. We consider both primary D-D and secondary D-T reactions. Conditions of energy break-even were found to occur at temperatures of the order of 10^6 K .

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