

Nuclear deflagration phenomenon and prospective concept of safe fast breeder reactor

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This review discusses the physical nature and conditions governing the phenomenon of slow nuclear burning in a breeding medium - "nuclear deflagration"- specifically in the breeding zone of a fast breeder reactor. A brief overview is provided of various theoretical approaches to describing this phenomenon and the results obtained based on them [1–4]. The results of our study of the nuclear deflagration in the form of nuclear burning wave are presented. This study is based on an original deterministic approach that relies on the numerical solution of a non-stationary, nonlinear, multi-group neutron diffusion equation in conjunction with a system of fuel nuclide burnup equations and equations of nuclear kinetics of precursors of delayed neutrons [5–7]. The unique "intrinsic safety" properties and other advantages of a promising fast breeder reactor operating in a nuclear burning wave mode are discussed; the main parameters of such a reactor are presented; and problematic issues and possible solutions are addressed.

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