Fissile plasma gas dynamics

Shapiyeva A.Ye.[1,@] **and Kunakov S.K.**[2]

[1] International Information Technology University, Manas 34A, Almaty, 050040, None

[2] Suleyman Demirel University, 1/1 Abylaikhan Street, Kaskelen, Almaty, 040900, Kazakhstan

[@] a.shapiyeva@iitu.edu.kz

A fissile gas is a gaseous medium containing atoms capable of undergoing nuclear fission reactions, typically composed of radioactive isotopes. Traditional hydrodynamic models based on classical assumptions fail to fully describe the coupling between nuclear fission processes and the dynamics of neutral gas components. This limitation arises because the governing hydrodynamic equations should be derived from self-consistent kinetic Boltzmann equations specifically formulated for fissile plasma systems [1]. In this work, we derive hydrodynamic equations governing the behavior of a fissile gas under neutron flux irradiation, starting from a system of self-consistent Boltzmann equations for fission fragments, electrons, and neutral particles. The resulting model reveals that the generation of high-energy fission fragments and electrons strongly affects both transport properties and chemical kinetics of the neutral gas, influencing the overall gas-dynamic structure [2]. These results advance the understanding of energy and momentum transport in non-ideal fissile plasmas, bridging the gap between nuclear reaction dynamics and plasma-fluid transport theory.

[1] Reshmin A, Lushchik V and Iosilevsky I 2018 *Proc. Russ. Acad. Sci. Fluid. Gas. Mech.* **4** 113–135

[2] Ryspekova A, Bolatov Z and Kunakov S 2015 *International Journal of Mathematics and Physics* **6**(1) 45–47