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Stimulated cold fusion by positronium atoms, cross sections, and wall interactions in plasmas, used to diagnostics

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Because of the technical complexities, involved in the controlled thermonuclear, reactions, a simple vicegerent agent cold plasma, stimulated by positronium atoms (achieved through a ring storage) as stimulus, introduced by this author in ITC 12/conference [1].

In the present paper, the interaction between γ rays emitted through positronium atoms annihilation (in the forms of doublet and triplet electromagnetic photonic radiation) with plasma particles (including electrons, ions and neutral particles) investigated. Proper lifetime of singlet γ rays τs are about 100ns and from that of triplet γ rays, i.e τt about 100 fems, reside in the following transition times in Ne and Argon elements in He-Ne and Ar lasers respectively:

$$Ne^*(3S2)\ [\text{transition time } \tau = 105\ ns] \rightarrow Ne^*(2P4)$$

$$Ar+^*(3P4\ 4S)\ [\text{transition time } \tau = 105\ fems] \rightarrow Ar+(3P5)$$

Then the interactions of γ rays with mater in plasma could follow up as treated from that of the laser and mater in one extreme while the comparison of this situation with normal plasmas in other extreme could serve as diagnostics key role in magnetically confined plasmas reactors. Collisions between charge and neutral species in plasma with electromagnetic radiation (γ photonic radiation) including the energy loss and scattering lead to different consequences. Light electrons can take up appreciably amounts of energy from the incident rays, lead to heating cold plasma, whereas massive ions absorb very little energy. Thus loss of incident energy in radiation occurs almost entirely in collisions with electrons , which, referred to the γ rays energy this would led to plasma heating about thermonuclear reaction ($E\gamma = h\upsilon = 0.5$ Mev). The heavy ions and neutral species in interaction with electromagnetic γ radiation, result on the other hand in scattering, in turn may increase the ionization level of the cold plasma, toward fully ionized plasma.

Although all the essential features of these different interaction cross sections deduced classically or semi classically as their origin here, but to obtain exact results a rather quantum mechanical treatment is also handled. The order of magnitude of quantum effects derived from uncertainty principle. Through this individual research introduced here, the scattering process of the γ radiation including Thomson scattering in one extreme, together with Compton scattering in other extreme leads to heating plasma media again helps to produce thermonuclear reaction yet. The absorption of the γ radiation by the plasma media included also, Rayleigh and Raman (Stokes) scattering in turn served as another agent to heat the cold plasma. Also in this paper, all the possible cross sections of the above mentioned collisions calculated where as the probability of the impact between incident γ-ray with walls, in magnetic confined devices (including tokamaks) has been taken into account and the diagnostics aspects are also discussed. In the conclusion and remarks the fruitfulness of the method elucidated. The simulation of theory is in development.

[1] Z. Emami, J. Plasma Fusion, Res. Series, Vol. **5** (2002) 370.