

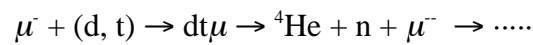
Recent Progress in Muon Catalyzed Fusion

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Muon catalyzed fusion (μ CF) was intensively studied in the recent 25 years both, experimentally and theoretically¹. It is now well established that one negatively charged muon (μ^-) in the dense mixtures D-T of deuterium and tritium can catalyze ~ 130 dt-fusions according to chain:



The key point of μ CF-phenomenon is the resonant formation of mesic molecules, followed by nuclear fusion from the states of mesic molecules. It gives the opportunity to study the nuclear fusion reactions at zero energy collisions and from the initial states with definite quantum numbers. In these few years, several new discoveries have been undertaken in the μ CF experiments such as (a) anomalous condensed-matter effect in both molecular formation (D_2 , D-T) and μ^- regeneration from the alpha sticking (D-T), (b) high temperature and energetic ($t\mu$) effect in molecular formation (D-T), (c) ortho - para effect in molecular formation (D_2), (d) final state interaction effect in reaction $tt \rightarrow \alpha + 2n$, etc.².

The other applications of μ CF-methods are the theoretical studies in the quantum Coulomb three-body problem, quantum electrodynamics, astrophysics, \bar{p} -physics etc., which are also outlined.

The μ CF opens the way to use this phenomenon for construction of the intense 14-MeV neutron source and the effective breeder with multiplication factor ~ 4 , both of which could be, at least partially, realized at JAERI-KEK Joint High Intensity Proton Accelerator project.

The program of the future μ CF-research is discussed.

References

1. *Muon Catalyzed Fusion*, v. **1-7**, 1987-1992, Basel; *Hyperfine Interactions*, v. **82** (1993), v.**101/102** (1996), v. **118/119** (1999).
2. *Proc. Int. RIKEN Conferece μ CF01*, Apr. 2001 Shimoda, Japan (in Press).