

Recent Progress in Muon Beam Development for Advanced Muon Catalyzed Fusion and Related Muon Science

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Since the latest MuCF conference (Shimoda, 2001), there have been three directional progresses in the development of muon beam production, namely 1) a construction of a new muon facility at high intensity proton accelerator like J-PARC [1], b) a proposal and a design of the advanced muon beam with a narrow, straight and high-energy nature [2] and c) introduction of the concept of the compact and mobile muon source [3]. All of these new directions will potentially be used for further understandings of fundamental physics of MuCF phenomena and for application of the MuCF phenomena to fusion energy and related muon sciences. Distinguished examples are as follows; by using the advanced muon beam, the MuCF studies will be carried out in D-T or D₂ under extremely high pressure, which may provide key information to solve the long-standing problems of the MuCF e.g. details of 3-body collision effects of muon molecular formation rate at high density D-T mixture [4], strange muon regeneration from muon-alpha sticking in solid D-T [5] and ortho-para effect in D₂ [6a, 6b]. At the same time, the MuCF phenomena will become jointly used in a coupling with the conventional fusion energy to enhance the efficiency of energy production [7].

Some of these topics will be presented.

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- [1] Y. Miyake *et al.*, Contribution to this meeting (2007).
 - [2] H. Miyadera *et al.*, Contribution to NuFact 06 (2006, Irvine).
 - [3] K. Nagamine, Proc. Jpn. Acad., Ser. **B80**, 179 (2004).
 - [4] L.I. Menshikov and L.I. Ponomarev, Phys. Lett., **167B**, 141 (1986).
 - [5] N. Kawamura *et al.*, Phys. Rev. Lett. **90**, 043401 (2003).
 - [6] a) A. Toyoda *et al.*, Phys. Rev. Lett. **90**, 243401 (2001); b) H. Imao *et al.*, Phys. Lett. **B632**, 192 (2006).
 - [7] W.P.S. Tan, Nature **263** 656 (1976).