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Recent Progress in Muon Science; Fusion Energy and Industrial Homeland -Security Application

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(1) Recently, unexpected phenomenon were discovered in muon catalyzed fusion experiment on D-T mixture: i) Anomalous μ^- regeneration from the stuck $(\alpha\mu)^+$ after the μCF in condensed D-T mixture suggesting an enhanced regeneration and reduced muon sticking in high-T condensed D-T ; ii) Sensitive dependence of $(dd\mu)$ molecular formation on the ortho/para-state controlled D_2 suggesting an enhanced $(dt\mu)$ formation in D-T mixture. Now, a clear future is seen for a realization of break-even. (2) By using the detection system of the near-horizontal cosmic-ray muon radiography originally developed for probing volcanic mountains, measurements were conducted to probe the inner structure of a blast furnace. The thickness of the brickwork was measured, yielding a crucial information for predicting the lifetime of the furnace. By extending muon radiography method using a compact accelerator system, a quick and element-selective detection of hidden special nuclear materials will become possible.