

# Development of room-temperature thermal-muonium-emitting material for ultra-slow muon production

*Dienstag, 16. September 2014 17:30 (1 Stunde)*

Ultra-slow muons, which are positive muons having an energy of a few eV, are useful tools for producing variable-energy muon beams with extraordinarily small energy spread by accelerating them through an electrostatic field. This technique has attracted attention for extending muSR studies to thin films, surfaces and interfaces, and nano-structures, which has not yet been achieved by the conventional muSR technique using surface muons. We will also apply this new technique to a measurement of the muon anomalous magnetic moment  $g-2$  and electric dipole moment at J-PARC [1], which requires an intense muon beam having an extremely small transverse momentum.

The ultra-slow muon production has been realized by laser ionization of thermal muonium atom (Mu) emitted from a tungsten foil heated to 2300 K [2]. On the other hand, it is known that silica powder is useful as a Mu-emitting material at room temperature [3]. We are investigating the possible use of silica aerogel, a material similar to silica powder, as a room-temperature self-standing Mu-emitting material. The room-temperature target has the following significant merits: 1) experimentally easy to handle (no significant heat), 2) smaller emittance of the ionized source (lower Mu energies), 3) smaller spatial spread and smaller Doppler broadening (thanks to lower Mu energy distribution) leading to a more efficient use of the available laser power.

In the TRIUMF S1249 experiment, Mu emission from silica aerogel into vacuum was observed [4]; and the recent measurement (Oct, 2013) yielded promising results with aerogels having a surface with sub-mm structures such as pores. For practical development, we are now preparing an ultra-slow muon beamline dedicated to the research and development of ultra-slow muon production with room-temperature targets at RIKEN-RAL port3.

In this presentation we introduce these studies with the preliminary results and a future plan of the room-temperature target study at RIKEN-RAL ultra-slow muon beamline.

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**Sitzung Einordnung:** Poster