


| | |
|--|--|
|  MLF Experimental Report | 提出日 Date of Report |
| 課題番号 Project No. 2016A0295 実験課題名 Title of experiment Detection and separation of muonic atoms by TOF-MS technique 実験責任者名 Name of principal investigator Kazuhiko Ninomiya 所属 Affiliation Osaka University | 装置責任者 Name of responsible person Y. Miyake 装置名 Name of Instrument/(BL No.) Muon D2 実施日 Date of Experiment 2016/12/3-4 |

試料、実験方法、利用の結果得られた主なデータ、考察、結論等を、記述して下さい。(適宜、図表添付のこと)
 Please report your samples, experimental method and results, discussion and conclusions. Please add figures and tables for better explanation.

| |
|--|
| 1. 試料 Name of sample(s) and chemical formula, or compositions including physical form. |
| PTFE foil |

| |
|---|
| 2. 実験方法及び結果 (実験がうまくいかなかった場合、その理由を記述してください。) |
| Experimental method and results. If you failed to conduct experiment as planned, please describe reasons. |
| <p>The final goal of our work is observation of chemical reaction of muonic atom, and investigation of detail chemical property of muonic atom such as reaction rate, reaction enthalpy and so on. For this purpose, the extraction system of muonic atom is essential. In this work, we will develop muonic atom separation and detection system using TOF technique, and determine emission provability of muonic atom from porous PTFE films.</p> <p>The TOF measurement system was already established. We will conduct test experiments by using this system. The systems consist of vacuum chambers, electrodes for muonic atom acceleration, muonic atom ion production target (poly tetra fluoro ethylene: PTFE and graphite) and micro channel plate for muonic atom ion detection. The experimental set up is shown in Figure 1. TOF-MS detection system has already been prepared and will be tested in January 2016 [2015A0237]. In this study, we added the muonic atom bending system to reduce background signals.</p> |

2. 実験方法及び結果(つづき) Experimental method and results (continued)

Muonic atom becomes highly positively charged state just after its formation. When a muon is captured by molecule, muonic atom is free from chemical bond and accelerated by Coulomb repulsion (Coulomb explosion). As a result, a part of muonic atom will be emitted from the target surface to vacuum. In this study, muonic atom will be accelerated by electric field with 5 kV (to reduce spatial distribution, we will perform two step acceleration, 500+4500kV). To detect muonic atoms, we will use time of flight technique using MCP detector.

Figure 2 shows the experimental results of this study. We successfully reduce background signals by employing muonic atom bending system. Though muonic atom signal (~ 1150 ns) were not identified in this study, we estimated that it will be detected in 500 kW accelerator powered condition.

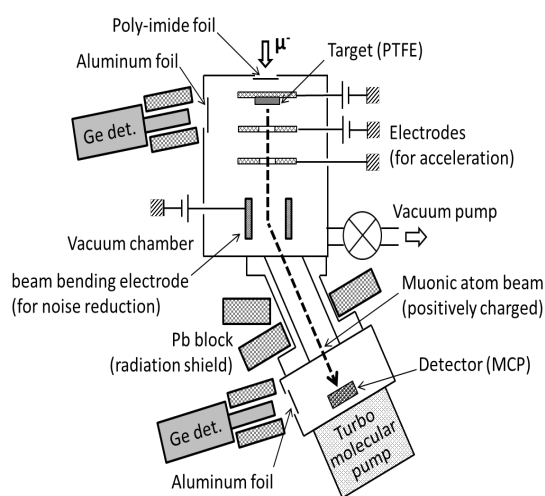


Figure 1: schematic view of the experimental system of this study

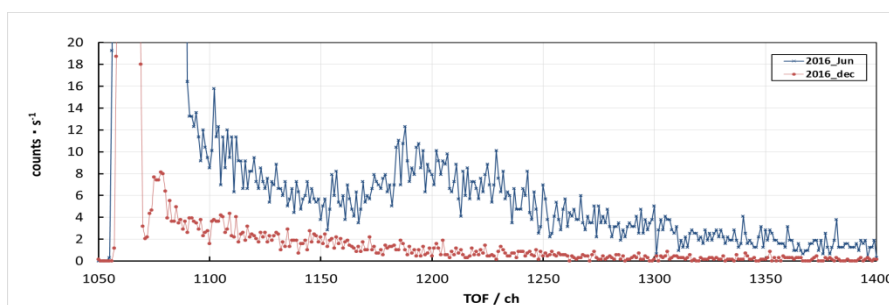


Figure 2: TOF spectrum of muon irradiation for PTFE foil