

(※本報告書は英語で記述してください。ただし、産業利用課題として採択されている方は日本語で記述していただいても結構です。)

 <b>MLF Experimental Report</b>	提出日 Date of Report 2011/07/12
課題番号 Project No. 2010B0052 実験課題名 Title of experiment Systematic study of muon initial states captured in oxygen compounds using low pressure gases 実験責任者名 Name of principal investigator Kazuhiko NINOMIYA 所属 Affiliation JAEA-ASRC	装置責任者 Name of responsible person Yasuhiro Miyake 装置名 Name of Instrument/(BL No.) D1/MUSE 実施日 Date of Experiment 2010/12/13-15

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.  di-nitrogen mono-oxide (N <sub>2</sub> O) gas, 0.1, 0.2, 0.4, 1.0 atm
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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.  Muonic atom is an atomic system that has one negatively charged muon instead of an electron. Muonic atom is formed when a negative muon is stopped in matter. The muon that is captured in Coulomb field of a nucleus immediately deexcites to muonic 1s state with characteristic muonic X-ray and Auger electron emissions. It is known that muonic X-ray structure such as Ka/Kb X-ray ratio is strongly influenced by the sample condition. Muonic X-ray structure is changed by the molecular structure of the sample if the muon is captured on the same element (molecular effect). This structure also influenced by the sample density (pressure effect).  Our group has been studying on molecular effect in the formation process of muonic atom from muonic X-ray measurement. For this purpose, it is essential to estimate pressure effect, quantitatively. In this work, we measured muonic X-ray spectra for di-nitrogen mono-oxide (N <sub>2</sub> O) samples with 0.1-1.0 atm and investigate pressure dependence of muonic X-ray spectra.
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## 2. 実験方法及び結果(つづき) Experimental method and results (continued)

Figure 1 shows schematic view of this experiment. Muonic X-rays were measured by three high-purity germanium detectors. Figure 2 shows the muonic X-ray spectrum for  $N_2O$  sample. From muonic X-ray structures for various pressure conditions, we conclude that pressure dependence is neglectable below 0.2 atm.

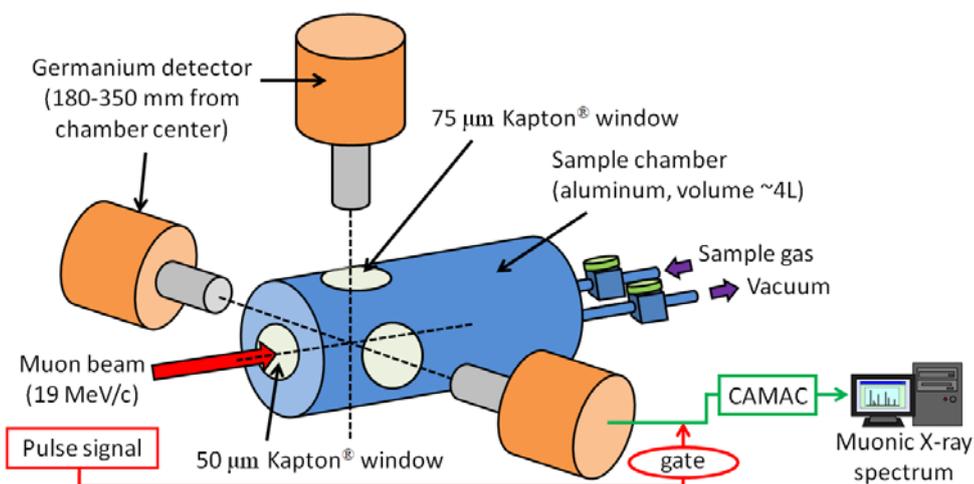


Fig 1: experimental setup of this study

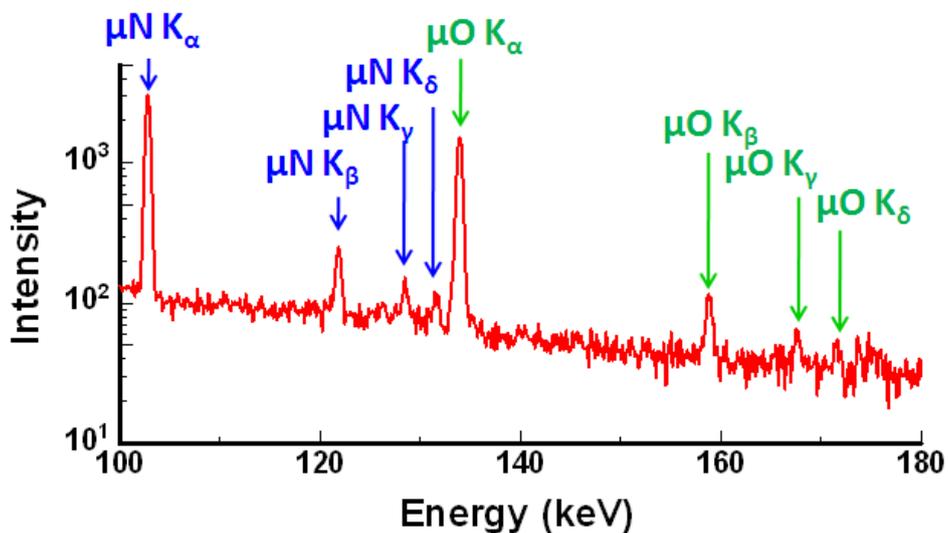


Fig 2: muonic X-ray spectrum for  $N_2O$  sample with 1.0 atm