 MLF Experimental Report	提出日 Date of Report
課題番号 Project No. 2015A0192 実験課題名 Title of experiment Investigation of chemical environmental effect in muonic atom formation for low pressure gaseous molecules containing sulfur atoms 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 Miyake Yasuhiro 装置名 Name of Instrument/(BL No.) MUSE D1 実施日 Date of Experiment 2016/4/25-26

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.
H2 gas COS gas CS2 gas

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>When a negatively charged muon is captured by an atom, muonic atom is formed. There are two process of muonic atom formation, one is a negative muon is directly captured by an atom (direct capture), and the other is muonic hydrogen atom is firstly formed and then the heavier nucleus takes the negative muon from the muonic hydrogen atom(muon transfer). The muon capture process is significantly affected by the chemical environment of the atom (chemical effect). In this study, we focused on muon capture probability of each atom and initial quantum state of the captured muon for COS and CS2 molecules through muonic atom formation by muon direct capture and muon transfer processes.</p>

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

Figure 1 shows schematic view of experimental system. We irradiated muons in the low pressure (~ 0.2 bar) gas samples and measured muonic X-rays by high-purity germanium detectors. The obtained muonic X-ray spectrum for COS sample is shown in Figure 2. From muonic X-ray intensities, we determined muon capture ratios as $A(S/C) = 2.46 \pm 0.12$ for COS and $A(S/C) = 3.35 \pm 0.09$ for CS₂. Muon capture ratios were clearly changed by the molecular structure, and we are now starting discussion of chemical effect in muon capture process using molecular orbital calculations.

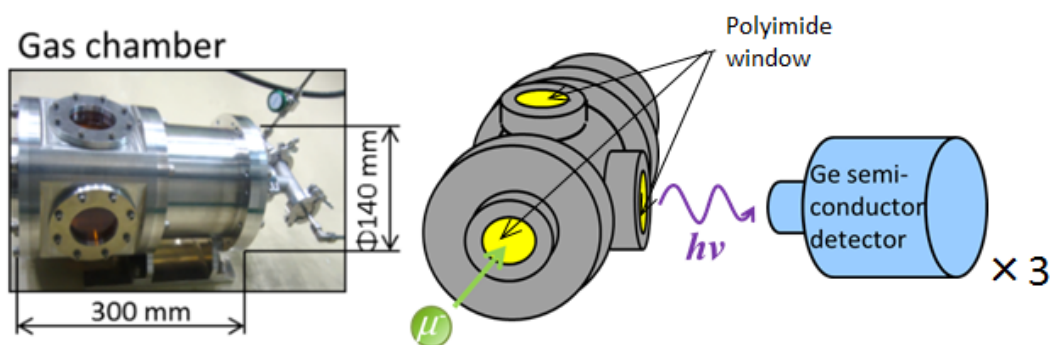


Figure 1. Schematic view of the experimental system.

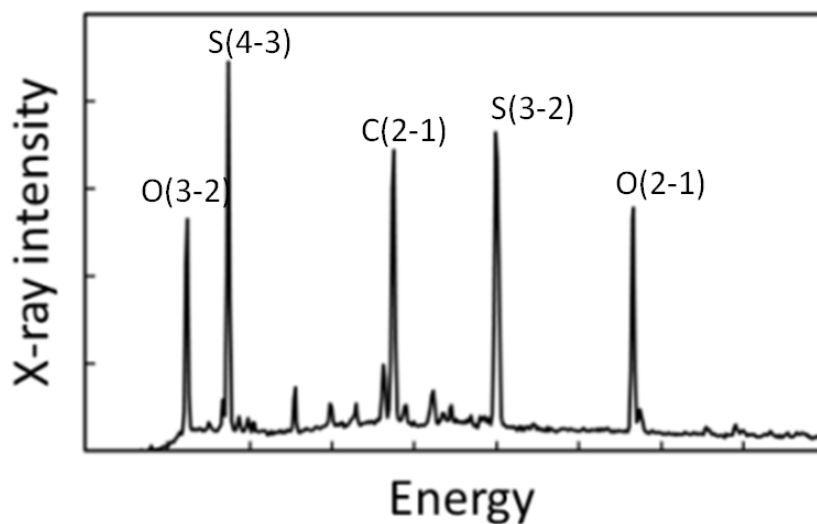


Figure 2. Muonic X-ray spectrum for COS sample.