


実験報告書様式(一般利用課題・成果公開利用)

(※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。)

 MLF Experimental Report	提出日 Date of Report
課題番号 Project No. 2012A0039 実験課題名 Title of experiment Investigation of muonic nitrogen and oxygen atom velocities after muon capture on nitrogen dioxide molecule 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 Yasuhiro Miyake 装置名 Name of Instrument/(BL No.) MUSE D1 実施日 Date of Experiment 2012/6/9-2012/6/12

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.
<p>Ne, CO, CO₂, COS gases</p>

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 negative muon approaches to an atom, the muon is captured on the Coulomb field of the nucleus and a muonic atom is formed. Characteristic muonic X-rays and Auger electrons are emitted after formation of the muonic atom following to muon deexcitation. It is known that muon capture process is strongly influenced by molecular structure of the muon capturing atom (molecular effect). In fact, muon capture probability of each atom (corresponds to total intensities of muonic X-rays of each atom) and structure of muonic X-rays (muon deexcitation path) are changed by molecules.</p>

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

To investigate muonic atom formation process precisely, muonic X-ray measurements for low pressure CO, CO₂, COS gases were performed. The obtained muonic X-ray spectra were shown in Figure 1. We determined muon capture probability for each element from total intensity of muonic Lyman X-rays. the obtained per atom muon capture ratios are summarized in Table 1. Unexpectedly, our results were not reproduced by the previous empirical models. We are now discussing on the influences in muon capture phenomena by molecular structure.

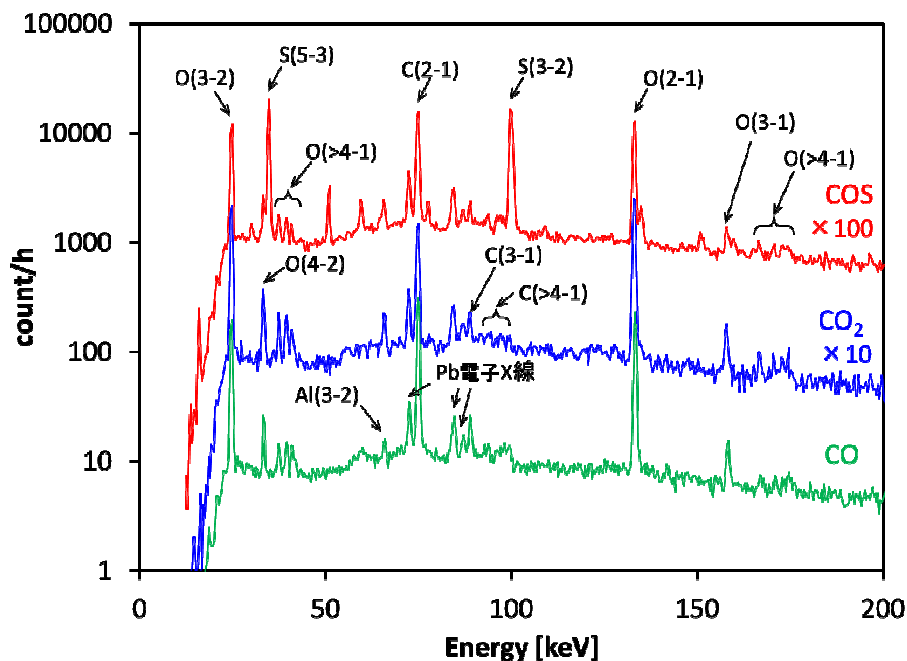


Figure 1. muonic X-ray spectra for CO, CO₂ and COS samples.

Table 1. summary of per atom muon capture ratios for various carbon oxides

	$A(C/O)_{CO}$	$A(C/O)_{CO_2}$	$A(C/O)_{COS}$
This work	0.75	0.55	0.50
Z-law[1]	0.75	0.75	0.75
LMM model[2]	0.79	0.25	0.25

[1] E.FERMI et al., Physical Review 72 399 (1947)

[2] N.IMANISHI et al., Physical Review A37 43 (1988)