MLF Experimental Report	提出日 Date of Report
課題番号 Project No. 2014A0196 実験課題名 Title of experiment Determination of muon transfer rate from muonic hydrogen atom in gaseous hydrocarbons 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 D1 実施日 Date of Experiment 2014/4/24-2014/4/26

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.

$Ne + H_2$ gas

$C_6H_6 + Ne + H_2$ gas

$C_6H_{12} + Ne + H_2$ 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.

Chemical environmental effect in muon capture process (molecular effect) have been examined for gaseous $C_6H_6 + Ne + H_2$ and $C_6H_{12} + Ne + H_2$ system. In hydrogen containing system, muon transfer process will occur. In this process, the muon firstly captures in hydrogen atom and forms muonic hydrogen. Because muonic hydrogen atom have a small muon atomic radius, the muonic hydrogen can be regarded as an quasi-neutron and can move among substance freely. When the muonic hydrogen approaches to the other nucleus, the atomic muon transfers to deeper atomic level of the nucleus. This process is called muon transfer process.

The molecular effect in muon transfer process have been reported [A. Shinohara et al., Hyperfine Interact. 106, 301 (1997), and our previous work 2012B0207], however the detail have still not been investigated.

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

The muon irradiation for gaseous C_6H_6 + Ne + H_2 and C_6H_{12} + Ne + H_2 system was performed and characteristic muonic X-rays emitted after muonic atom formation were measured using high-purity germanium detectors. Figure 1 shows the muonic X-ray spectra of C_6H_{12} + Ne + H_2 system. We can identify the component of muonic atom formation by muon transfer process by extracted delayed X-rays from muon beam pulse. From these spectra, we are now investigating the initial states of captured muons and muon transfer rates and discussing on the difference by molecular structure (C_6H_6 and C_6H_{12}).

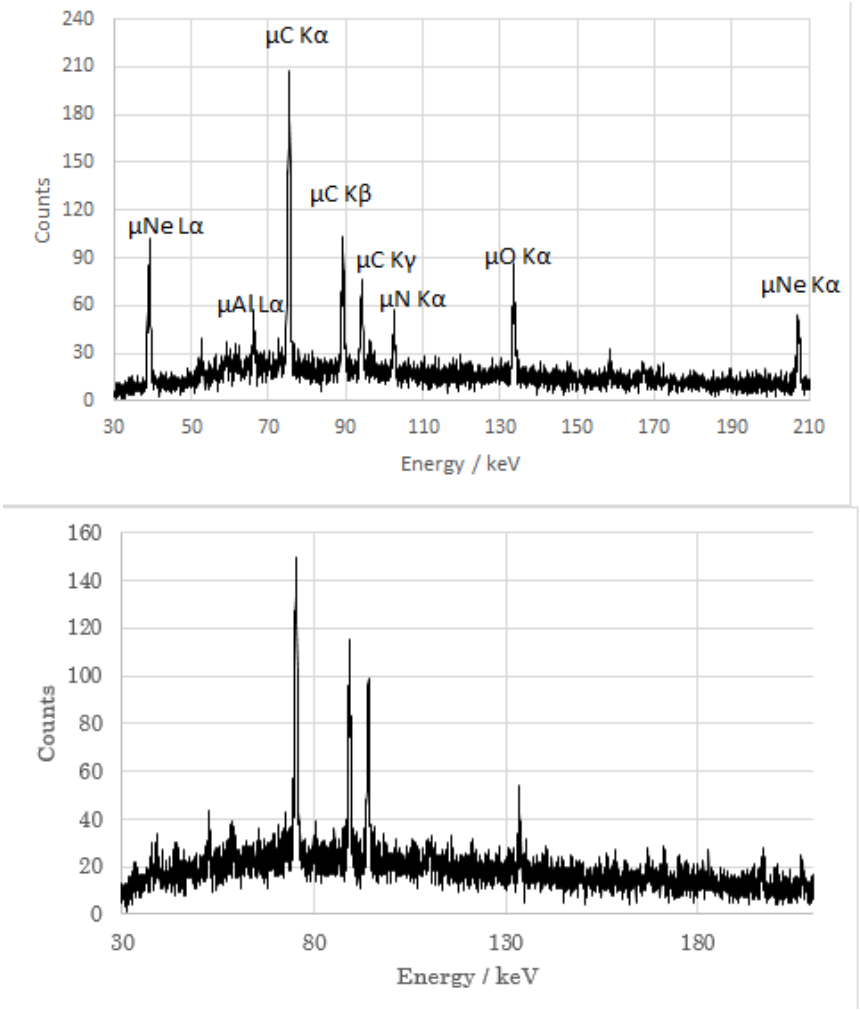

Figure 1 : Prompt (above) and delayed (bottom) muonic X-ray spectra for C_6H_{12} + Ne + H_2 system.