(※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 Jan 26 2013
課題番号 Project No. 2012A0151 実験課題名 Title of experiment The electronic structure and magnetic properties of copper nanoparticles stabilized with organic surfactants 実験責任者名 Name of principal investigator Khashayar Ghandi 所属 Affiliation Mount Allison University	装置責任者 Name of responsible person Khashayar Ghandi, Y. Miyake, Fraser Burns, Amy Maclean 装置名 Name of Instrument/(BL No.) D2 実施日 Date of Experiment November 2012

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.

1) Spherical copper nanoparticle and oxidized copper nanoparticles adsorbed by PIL 104 [32C 1P 68H] (cation) [2O 1P 16C 34H] (anion).
2) Methyl, diOctyl Benzyl ammonium iron chloride bromide

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.

We used TF and LF μSR a at different fields and temperatures as well as ZF- μSR at different temperatures..
The ZF- μSR experiments were performed at 10 to 330 K. The TF experiments were performed at close to 20G in the same range of temperature and the LF experiments were performed in the same range of temperature from 0 to ~1000 G. The samples were in the liquid form at highest temperature and solid at lowest temperature. All samples were run in sealed cells (see figure 1) after very careful freeze/pump/thaw cycles to make sure the residual oxygen were removed.

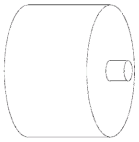

Figure 1 The schematic drawing of the solid/ liquid μSR cell. The muon window is on the left (bottom) and the injection port is on the right (top) and it is via pipe tread fitting and a cap with Teflon tape for further sealing. This cell was used also to detect Muonium in liquids to make sure it works without leak.

After the freeze/pump/thaw cycles the samples were kept in the glove box under nitrogen with [O_2] less than 1 ppb while heating to flow N_2 and saturate the sample with N_2 (this way practically no O_2 would be remained in the sample as any remained O_2 would be replaced by N_2.).
Examples of our data are presented in the following. First we compare our studies of copper nanoparticles and copper oxide nanoparticles. The surfactant and nanoparticle size were the same.

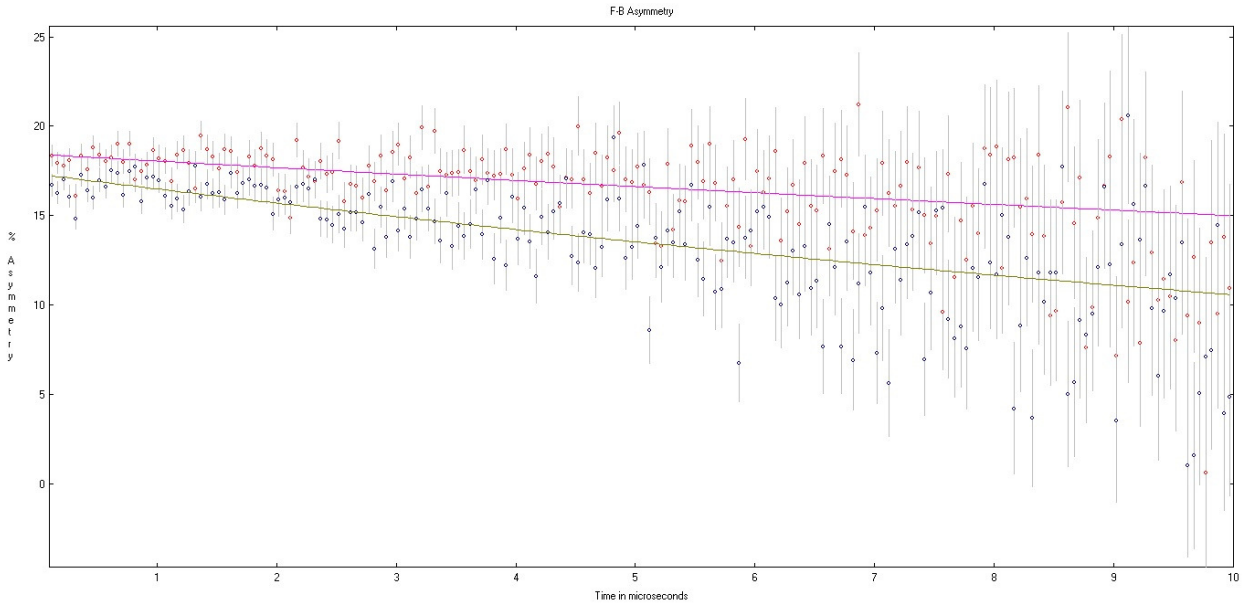

Figure 2 The Zero field μsR asymmetry of copper (red circles and curve) and copper oxide (blue circles and curve) nanoparticles solutions in the phosphonium ionic liquid at 330 K.

It is clear (Figure 2) that the asymmetry at zero field and at 330 K relaxes faster for muons in copper oxide nanoparticle solution than in copper nanoparticle solution.

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

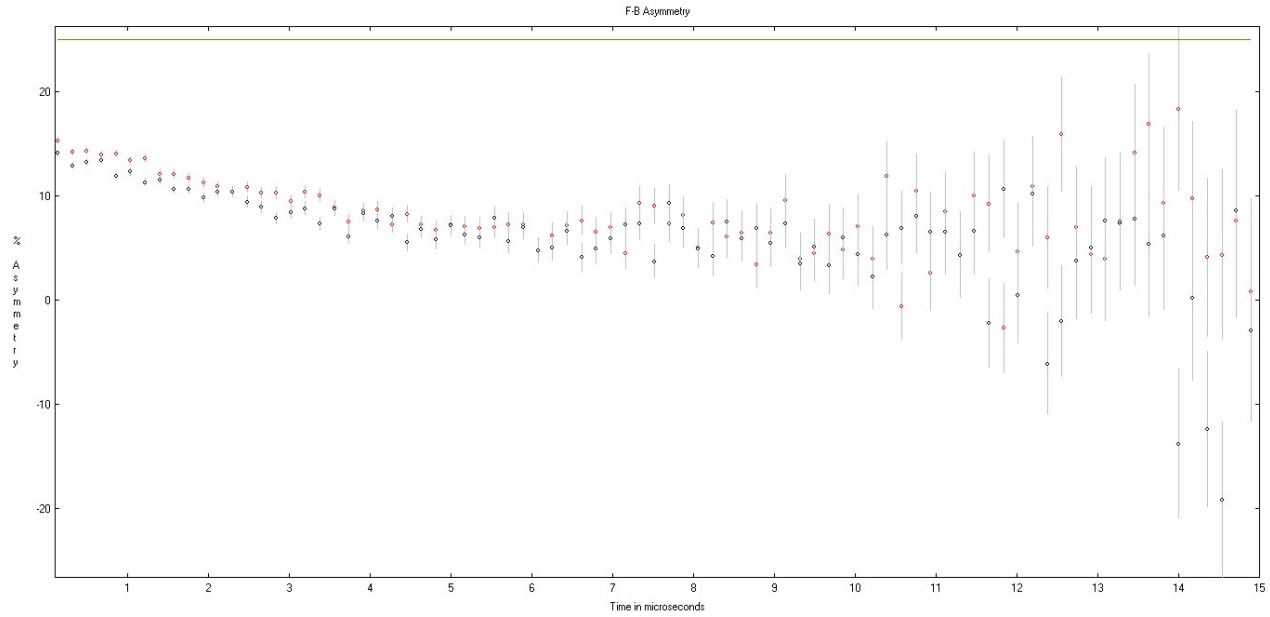

Figure 3 The Zero field μsR asymmetry of copper (red circles) and copper oxide (blue circles) nanoparticles solutions in the phosphonium ionic liquid at 30 K.

On the other hand it is clear (Figure 3) that the asymmetries at zero field and at 30 K are very similar for muons in copper oxide nanoparticle solution and in copper nanoparticle solution. Therefore the differences observed at 330 K are due to a dynamic effect. The dynamic effect is however quenched at 1400 G completely (Figure 4).

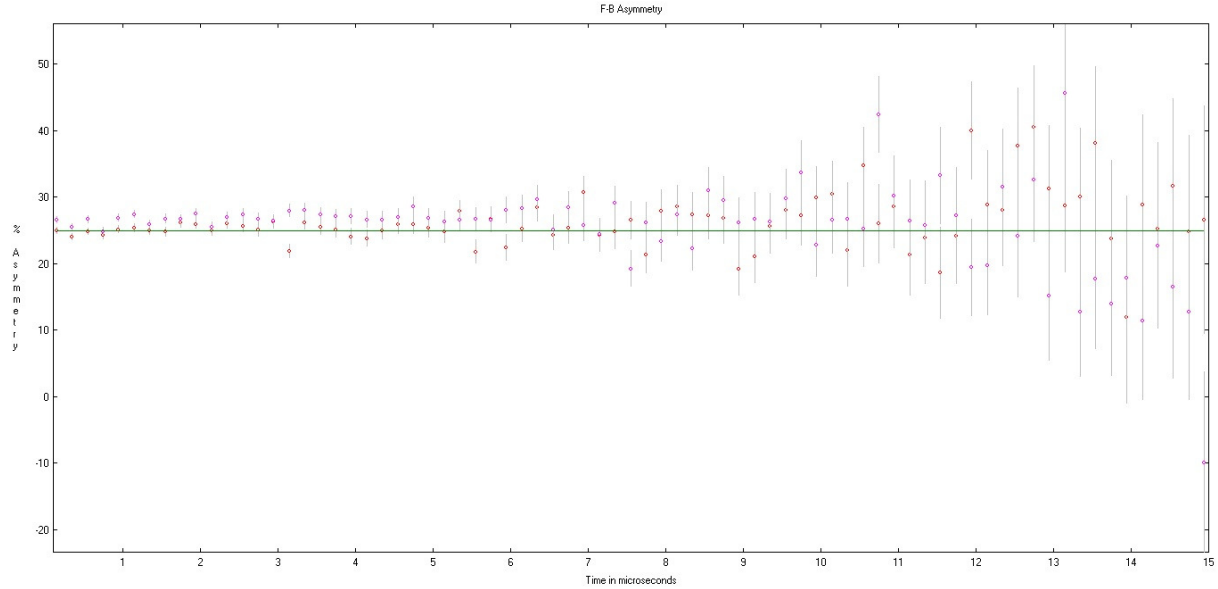

Figure 4 The Zero field μsR asymmetry of copper (red circles) and copper oxide (pink circles) nanoparticles solutions in the phosphonium ionic liquid at 330 K and at 1400 G.

以下は、MLFで内部資料として使用します。(日本語可)
The following sheet is for internal use only.　Description in Japanese is acceptable.

〇論文等による成果発表の予定 (Your publication plan)

a) 発表形式(*1) Publication style(*1)	b) 発表先(誌名、講演先)(*2) Publication/Meeting information(*2) (Name of journal/book or meeting)	c)投稿/発表時期(*3) Date of paper submission or presentation(*3)
Refereed publication	We are planning to submit this work (after theoretical analysis is done) to PCCP or J. Phys. Chem	

【記入要領】(Instructions)

(*1) 原著論文、総説、プロシーディングス、単行本、特許、招待講演(国際会議)、その他口頭発表等、具体的な発表方法を示して下さい。
Please describe planned publication and/or presentation style; *ex.* refereed journal, review article, conference proceedings, book, patent, invited talk, oral presentation *etc.*

(*2) 成果を発表する誌名、講演先を示して下さい。
Please describe the name of journal or book you are planning to submit, or name of meeting you will make a presentation.

(*3) およその発表予定時期を示して下さい。(3月以内、6月以内、1年以内、2年以内、2年以上先、等)
Please describe the estimated date of paper submission or presentation; *ex.* within 3 months, within 6 months, within 1 year, within 2 years, beyond 2 years, *etc.*

〇成果になる予定が立たない場合の理由と今後の計画を記述してください。
In case you can not publish your results, please describe reasons and future plan.

(例:「論文になる十分な結果が得られなかった」、「複数回の実験が必要で次回の課題終了後に発表予定」、等)