

 <b>MLF Experimental Report</b>	提出日 Date of Report 2017. 4. 12
課題番号 Project No. 2016A0290 実験課題名 Title of experiment $\mu$ SR study of the chiral superconductivity in the honeycomb-lattice superconducting compounds 実験責任者名 Name of principal investigator Tadashi Adachi 所属 Affiliation Department of Engineering and Applied Sciences, Sophia University	装置責任者 Name of responsible person Yasuhiro Miyake 装置名 Name of Instrument/(BL No.) D1 実施日 Date of Experiment 2016. 12. 1 – 3

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.  Honeycomb-lattice superconducting compound $\text{BaPtAs}_{0.8}\text{Sb}_{0.2}$ A large amount of small single crystals
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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.  Zero-field, longitudinal-field and transverse-field $\mu$ SR measurements were performed using dilution refrigerator at low temperatures between 24 mK and 5 K and in magnetic fields up to 100 G for the honeycomb-lattice superconducting single crystals of $\text{BaPtAs}_{0.8}\text{Sb}_{0.2}$ with the superconducting transition temperature $T_c \sim 3$ K. Measurements were performed in the double-pulsed mode.  In zero field, the $\mu$ SR time spectra were Gaussian-like at all temperatures measured and the behaviors of the spectra appeared to be temperature-independent. By analyzing the spectra using a simple function consisting of the Kubo-Toyabe function and exponential term, it was found that the depolarization rate of muon spins are almost constant against the temperature between 24 mK and 5 K.  The longitudinal-field measurement at 5 K showed the full decoupling of the spectrum at 100 G, suggesting the predominant effects of the nuclear-dipole fields on the spectra.
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## 2. 実験方法及び結果(つづき) Experimental method and results (continued)

In the transverse-field measurements in the field cooling process, it was found that the muon-spin precession observed at 5 K was damped at 100 mK, indicating the formation of the superconducting vortex state.

These results suggest that the spontaneous magnetic field due to the chiral  $d$ -wave superconductivity is absent in BaPtAs<sub>0.8</sub>Sb<sub>0.2</sub>, which is contrary to the results of honeycomb-lattice superconductor SrPtAs reported by Biswas *et al.* The reason is under consideration.

[1] P. K. Biswas, H. Luetkens, T. Neupert, T. Sturzer, C. Baines, G. Pascua, A. P. Schnyder, M. H. Fischer, J. Goryo, M. R. Lees, H. Maeter, F. Bruckner, H.-H. Klauss, M. Nicklas, P. J. Baker, A. D. Hillier, M. Sigrist, A. Amato, and D. Johrendt, Phys. Rev. B **87**, 180503(R) (2013).