



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。)

 Experimental Report 	承認日 Date of Approval 2015.1.4 承認者 Approver Jun-ichi SUZUKI 提出日 Date of Report 2014.10.2
課題番号 Project No. 2014A0303 実験課題名 Title of experiment Hierarchical structures of imidazolium-based ionic liquids 実験責任者名 Name of principal investigator Osamu Yamamuro 所属 Affiliation ISSP, University of Tokyo	装置責任者 Name of Instrument scientist Jun-ichi Suzuki 装置名 Name of Instrument/(BL No.) TAIKAN / BL15 実施日 Date of Experiment 2014/6/23~2014/6/26

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.
1. deuterated 1-hexadecyl-3-methylimidazolium hexafluorophosphate, C20D39F6N2P, solid 2. deuterated 1-octyl-3-methylimidazolium hexafluorophosphate, C12D23F6N2P, liquid 3. mixture of deuterated 1-octyl-3-methylimidazolium hexafluorophosphate and deuterated 1-decyl-3-methylimidazolium hexafluorophosphate, C12D23F6N2P/C14D27F6N2P, liquid

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>The purpose of the present experiment is to investigate the structures of ionic liquids and their liquid-crystalline (SmA) phases, especially on the low-Q peak around $0.2\text{-}0.3 \text{ \AA}^{-1}$ corresponding to nanometer-scale structures characteristic to ionic liquids. We have performed the neutron diffraction measurements of deuterated alkyl-methylimidazolium hexafluorophosphate $C_n\text{minPF}_6$ ($n = 16, 8, \text{ and } 9.5$ (mixture of 8 and 10)). These samples were contained in cylindrical cans made of aluminum. Figure 1 shows diffraction patterns of the liquid (L), liquid crystalline (LC) and crystalline (C) phases of $C_{16}\text{minPF}_6$. In the low Q region, large scatterings proportional to Q^{-4} appeared in all of the three phases. These may be due to grain boundaries or bubbles in the samples, not being intrinsic features of the samples. The low-Q peaks appeared at almost the same Q position (ca. 0.2 \AA^{-1}) in both L and LC phases. This result suggests that the origin of the low-Q peak in the L phase is the same as that of the SmA LC phase with a layer structure. The peaks corresponding to the inter-ionic correlations and inter-alkylchain correlations appeared around 1 \AA^{-1} in the L and LC phases. Similar results mentioned above were obtained in $C_{9.5}\text{minPF}_6$. In $C_{8}\text{minPF}_6$, where the L phase is supercooled down to 10 K, the intensity of the low-Q peak drastically increased with decreasing temperature, suggesting drastic formation of the nano-structure. Further analysis is now in progress for all samples.</p>

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

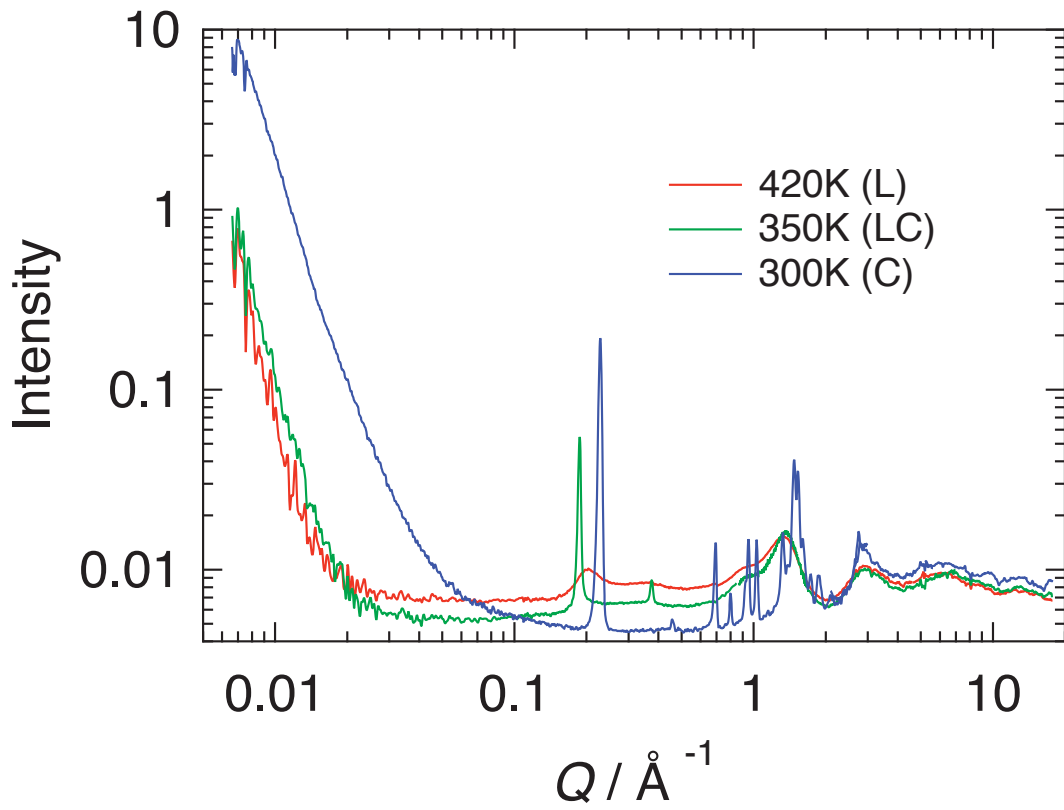


Figure 1. Neutron scattering patterns of the liquid (L), liquid-crystalline (LC) and crystalline (C) phases of C16mimPF₆