結晶融解を示す配位高分子の合成とリチウムイオン伝導特性

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Synthesis of meltable coordination polymers and their lithium-ion conducting property ([1]*Kyoto University*) ○Kotoha Kageyama,[1] Nattapol Ma,[1] Hiroyasu Tabe,[1] Satoshi Horike[1]

In the application of solid-state ionic conductors, control of heterogeneous interfaces as well as high conductivity is required. Coordination polymers (CPs) have good ionic conduction properties, and some of them have been revealed to have reversible phase transitions in recent years. They are expected to work as soft solid electrolytes. In this study, we synthesized meltable CPs and evaluated their thermal behavior and lithium-ion conductivity. We synthesized a coordination polymer $[Li(TFSI)(SN)_2]$ (**1**) from lithium bis(trifluoromethanesulfonyl)imide (LiTFSI) and succinonitrile (SN). Single crystal X-ray structure analysis indicated that **1** was 2D structure (**Figure 1a**). From differential scanning calorimetry (DSC, **Figure 1b**), crystal melting was observed at 53 °C and glass transition was observed upon cooling. Lithium-ion conduction properties were measured from the AC impedance method. Mechanical properties, including interface formation, were evaluated from dynamic viscoelasticity measurements.
Keywords: conductivity; lithium-ion; coordination polymer; electrolyte; melt

固体イオン伝導体の応用においては、高い伝導度とともに異種界面の制御が求められる。配位高分子（CPs）は良好なイオン伝導特性を有し、近年その一部は可逆的な相転移を示すものが見いだされている[1]。すなわち柔らかい固体電解質として働くことが期待される。本研究では結晶融解性 CPs を合成し、熱的挙動及びリチウムイオン伝導特性の評価を行った。LiTFSI とスクシノニトリル（SN）からなる配位高分子 $[Li(TFSI)(SN)_2]$（**1**）を合成した。単結晶 X 線構造解析により **1** は二次元構造であった（**Figure 1a**）。示差走査熱量測定（DSC, **Figure 1b**）から、53 ℃で結晶融解が、冷却時にガラス転移が観測された。リチウムイオン伝導特性は交流インピーダンス法から求めた。界面形成を含む機械特性は動的粘弾性測定から評価を行った。

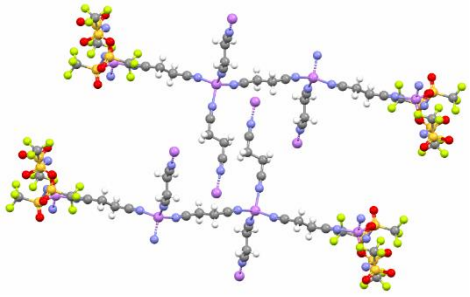

Figure 1a Structure of $[Li(TFSI)(SN)_2]$

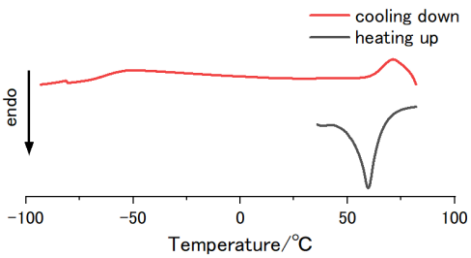

Figure 1b DSC profiles of 1

1) T. D. Bennett and S. Horike, *Nat. Rev. Mater.* **2018**, 3, 431-440