α-CD-PEO/Li$^+$固体聚合物电解质的固体核磁共振研究

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在本工作中，我们制备了 α-CD-PEO/Li$^+$复合物电解质，其结构如图 1 所示。通过固体核磁共振技术，我们对复合物中的分子链构象以及 Li 离子运动进行了研究。

我们通过 ^{2}H 核磁共振静态实验研究了具有不同 Li 离子浓度的复合材料中分子链的构象。图 2 为样品的 ^{2}H 静态实验谱图。谱图中不同的线型变化表明材料中存在由 Li 离子含量改变引起的分子链构象变化。通过 ^{7}Li 单脉冲实验，我们研究了体系中不同 Li 离子的运动性以及 Li 离子运动活化能（图 3）。实验结果表明，材料中的快速离子运动与材料的高电导率具有密切的关系。

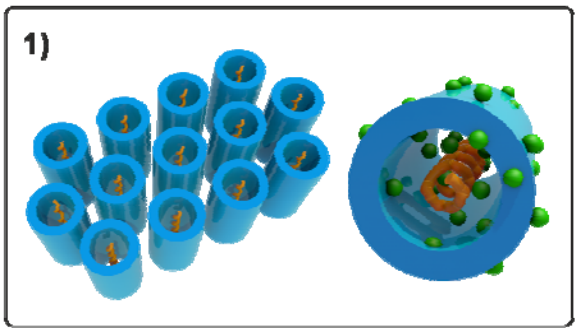

图 1 α-CD-PEO/Li$^+$聚合物电解质结构示意图。
Figure 1 The structural model of α-CD-PEO/Li$^+$ complexes.

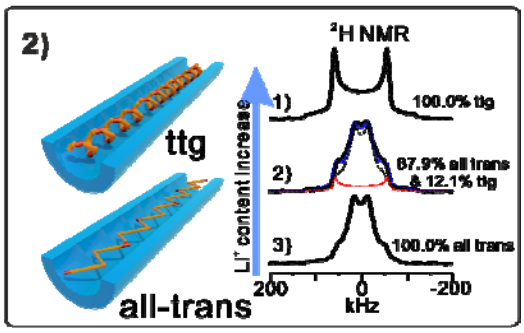

图 2 α-CD-PEO/Li$^+$电解质静态 ^{2}H 实验图谱。
Figure 2 ^{2}H solid-state NMR experiments of α-CD-PEO/Li$^+$ complexes at different Li$^+$ concentrations.

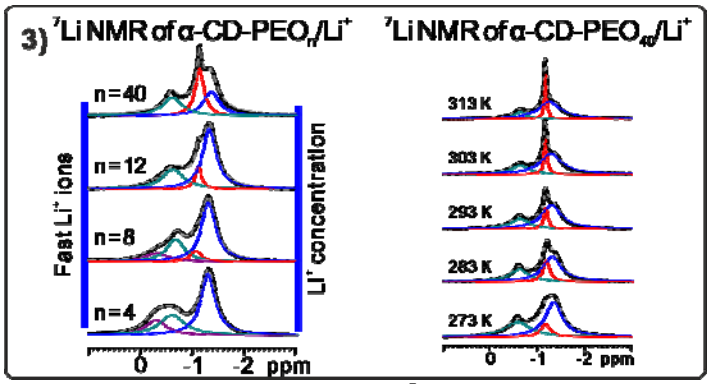

图 3 α-CD-PEO/Li$^+$聚合物电解质 ^{7}Li 单脉冲图谱。
Figure 3 ^{7}Li one pulse NMR spectra of α-CD-PEO/Li$^+$ complexes.

致谢：National Natural Science Foundation of China (21574043)

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Solid State NMR Studies of α-CD-PEO/Li^+ Solid Polymer Electrolytes

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In this work, we have prepared several α-CD-PEO/Li^+ solid polymer electrolytes. The structure model is shown in the cartoon picture in Figure 1. Solid-State NMR is used to investigate the conformation of polymer chains and dynamics of Li^+ in the sample.

Via static ^2H NMR, we have investigated the conformation of the PEO chains. Figure 2 shows static ^2H NMR spectra of α-CD-PEO/Li^+ complexes with different Li^+ concentrations. The different line-shapes of the signals in the spectra indicate that the conformation of PEO chains changes with the decrease in Li^+ concentration. The activation energies and dynamics of different Li^+ ions were studied by ^7Li one pulse NMR experiments. The results reveal that the high ionic conductivity of this solid polymer electrolyte is closely related with the fast Li^+ ion transportation.

Acknowledge: This work was financially supported by the National Natural Science Foundation of China (21574043).

References:

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