Organic nonvolatile resistive memory devices with helical polyisocyanide bearing oligothiophene

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Nonvolatile resistive memory devices using organic materials as an active layer have been attracted considerable attention as a promising candidate for an alternative to established inorganic memory devices. [1] We have reported that the memory devices employing polyisocyanides as an active layer exhibit excellent memory characteristics. [2] However, the operation mechanism of the memory characteristics remains unclear. In this study, we investigate the effect of a side chain unit in polyisosyanides on the memory characteristics.

The chemical structures of the polyisocyanides (Poly-7, Poly-D) and the device structure of the memory device are shown in Fig. 1. The memory device using Poly-7 only shows bipolar switching behavior (Fig. 2). This result indicates that the oligothiophene unit plays indispensable role to realize the resistive switching behavior. At the high current state, since the current density-voltage curve obeys ohmic conduction, we suspect that the metallic conduction paths are formed in the memory device.

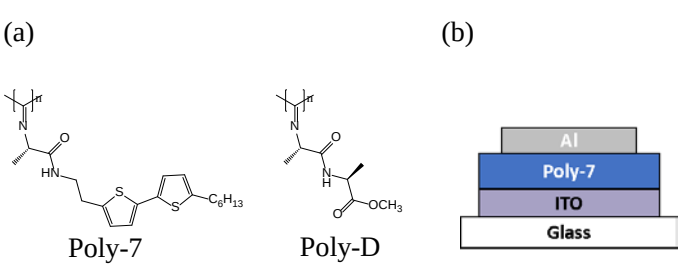

Fig. 1 Chemical structures of (a) Poly-7 and Poly-D, (b) structure of memory device used in this study

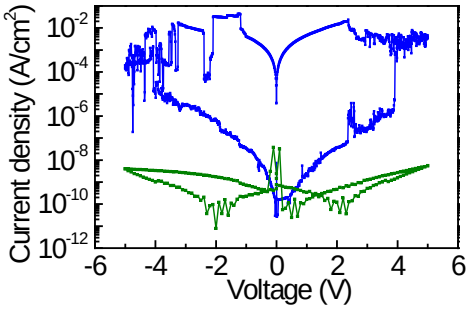

Fig. 2 I-V curve of ITO/Poly-7/Al (blue) and ITO/Poly-D/Al (green)

[1] Y. Li and Y. Shen, Polym. Eng. Sci., **54**, 2470 (2014).
[2] Y. Sakuragawa, Y. Takagi, T. Ikai, H. Sakai and H. Murata, The 75th JSAP Autumn Meeting, Extended Abstracts, pp.157 (2014)