Non-volatile Organic Memory Devices Based on Redox Proteins as a Charge Trapping Layer

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Organic memory has been considered as one of the most promising and emerging technologies in electronics markets because it has great potential to realize low costs, large area, and flexible data storage sites. The reversible electron transfer of redox proteins are caused by the heme structure which consists of an iron atom, which can cause redox reactions, surrounded with large cyclic organic rings. The heme structure is normally known as the main functional component of redox proteins such as hemoglobin, myoglobin, etc. The iron ion in the heme may be either in the Fe^{2+} state or the Fe^{2+} state. These oxidation and reduction processes happen repeatedly and reversibly. Using electrochemical properties of heme structures, we present here a non-volatile memory device based on heme proteins as a charge trapping layer. To fabricate these devices, active layers were deposited a substrate via solution process at room temperature. In conclusion, experimental results showed good programmable memory characteristics with a large memory window. We have demonstrated that heme structure including redox reactions functionality could potentially be adopted in flexible organic memory application.