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Additive-Driven Assembly of Block Copolymer-Nanoparticle Hybrid Materials for Solution Processable Floating Gate Memory QINGSHUO WEI, YING LIN, ERIC ANDERSON, ALEJANDRO BRISENO, SAMUEL GIDO, JAMES WATKINS, Department of Polymer Science and Engineering, University of Massachusetts Amherst — The preparation of well-ordered hybrid materials at nanoscale is not only fundamentally interesting but also of significant importance for the development of next generation functional devices. In this study, we present a simple approach for the preparation of well-ordered polymer/NP composites through the concept of additive-driven assembly, and its application for the fabrication of floating gate organic FET memory devices. The addition of gold NPs that selectively hydrogen bond with pyridine in poly(styrene-*b*-2-vinyl pyridine) is shown to induce an ordered structure. This enables the fabrication of well-ordered hybrid materials with lamellar domains at Au NP loadings of more than 40 wt%. The fabrication of floating gate memory devices was demonstrated by the ordered Au NPs / block copolymer hybrid film as a charge trapping layer, which is sandwiched between a SiO_2 dielectric layer and a poly(3-hexylthiophene) semiconductor layer. This approach enables us to fabricate well-ordered charge storage layers by solution processing and to achieve facile control of the memory windows by changing the density of gold NPs. The devices show high carrier mobility (> 0.1 cm^2/Vs), controllable memory windows (0$\sim$50V), high *on/off* ratio ($>10^5$) between memory states and long retention times ($>10^4$ s). This approach is potentially suitable for roll-to-roll printing techniques to make flexible, large area and high density devices.

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