Resistive Switching Memory Devices Based on Layer-by-Layer Assembled Multilayers

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We introduce a facile and robust approach for the preparation of superparamagnetic nanocomposite multilayers, which allows the highly enhanced magnetic and electronic properties as well as the dense and homogeneous adsorption of nanoparticles. By employing 2-bromo-2-methylpropionic acid (BMPA)-stabilized Fe3O4 nanoparticles (BMPA-SPMNPs) with bromo groups in toluene and highly branched poly(amidoamine) dendrimer (PAMA) with amino groups in ethanol, PAMA/BMPA-MP multilayers were prepared by nucleophilic substitution reaction without any phase transfer of BMPA-SPMNPs. The resulting superparamagnetic multilayers displayed highly improved magnetic properties in comparison with those of multilayers based on water-dispersible MPs. Furthermore, we demonstrated that these magnetic multilayers using nucleophilic substitution reactions could be used as an active layer for nonvolatile resistive switching memory (NRSM) devices comparable to that of conventional inorganic NRSM devices produced by vacuum deposition.