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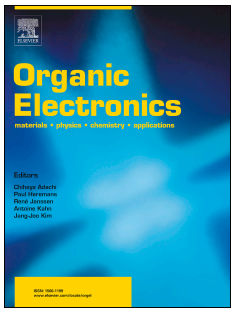

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N-Type Polymeric Organic Flash Memory Device: Effect of Reduced Graphene Oxide Floating Gate

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Abstract. In this paper, n type nonvolatile memory devices were fabricated by implanting a bilayer (rGO sheets/Au NP) floating gates, using n-type polymer semiconductor, poly {[N, N′ bis (2octyldodecyl) - naphthalene-1, 4, 5, 8 - bis (dicarboximide)-2,6-diyl] – alt - 5,5′ - (2, 2′ bithiophene)} [P(NDI2OD-T2)$_n$]. In the developed organic field effect transistor memory devices, electrons are trapped/ detrapped in rGO sheet/Au NP's nano-floating gates by controlling the charge carrier density in the active layer through back gate bias control. The devices showed interesting non-volatile memory properties with a large memory window of ~34 V, a programming-reading-erasing cycling endurance of 10^3 times and most importantly, an improved retention time characteristics estimated by extrapolation (longer than the technological requirement of commercial memory devices (>10 years)).This approach provides a great potential for fabricating high-performances organic nano-floating gate memory devices and opens up a new way for the development of next-generation non-volatile memory devices.

Key words. Field-effect transistor, Polyera^{TM} N2200, self-assembled monolayer, flash memory, reduce graphene oxide, gold nanoparticles

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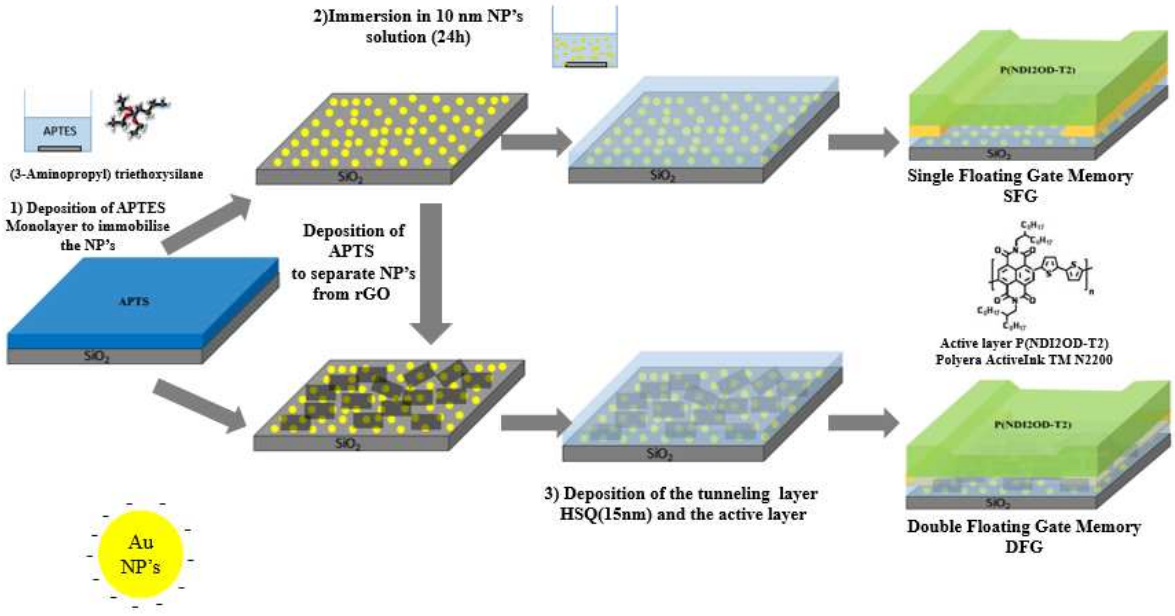

Figure 1. Fabrication process of the n-type organic memory devices. Gate and source/drain electrodes were thermally evaporated. The active layer [P (NDI2OD-T2)$_n$] and the tunneling dielectric layer (HSQ) and were deposited by spin-coating. The floating gate layer is composed of Au NP's and reduced graphene oxide.