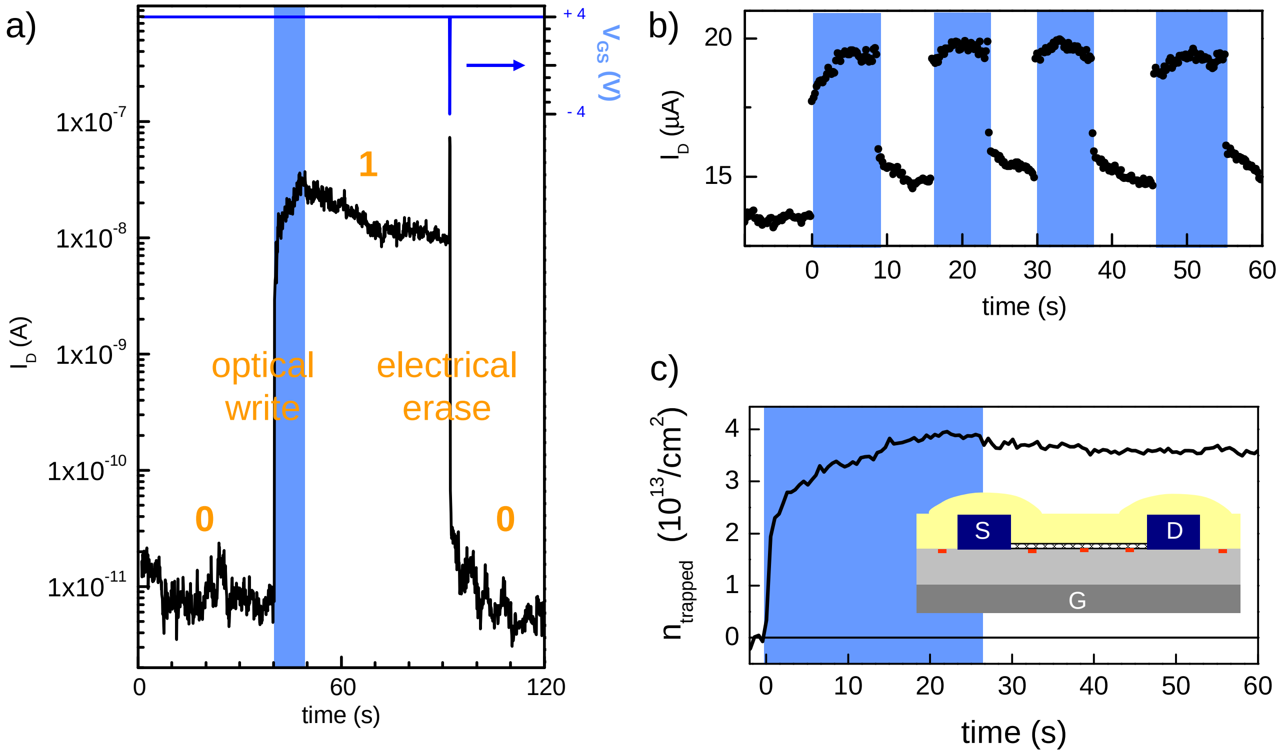

Figure 2 **Optical memory and switch based on the OG-CNTFET** (a) $I_D(t)$ response at $V_{GS}= +4$ V of an OG-CNTFET to a light pulse at $\lambda = 457$ nm (laser on in the blue shaded area). The current magnitude difference before and after illumination allows memory applications. The memory erase action is also shown. After the light pulse has been applied, a short (100 ms) negative V_{GS} pulse at -4 V is used to bring the device back to its initial state. (b) $I_D(t)$ response at $V_{GS}=$ -3 V of a device composed of multiple nanotubes to a light pulse at $\lambda = 457$ nm. The negative gate bias allows rapid optically driven modulation of the current. (c) Evaluation of the trapped electrons density $n_{trapped}$ obtained by comparing the $I_D(t)$ response at $V_{GS}= +4$ V with the transfer characteristic $I_D(V_{GS})$ in the dark. An I_D increase of 3 orders of magnitude for $V_{GS} = +\ 4$ V is equivalent to a negative gate shift of -5 V, created by 4.10^{14} charges/cm^2 ($Q = C_{ox}V_{GS}$) at the Si++/SiO_2 interface. Because the APTS layer is $\sim$ 1 nm thick (SiO_2 is 10nm thick), the same effective equivalent potential on the nanotube is created by $\sim 4.10^{13}$ charges/cm^2. The inset shows those interfacial traps (red dashes).

as a memory element (Fig 2a) or as an optical switch (Fig 2b). On the basis of a set of experiments performed with either CNTFETs or P3OT thin film transistors (TFT), we propose a mechanism based on the trapping of photo-generated electrons at the nanotube-gate dielectric interface. The results are consistent with the generally observed p-type conduction in organic TFTs (4). Thanks to its very high charge sensitivity, the nanotube transistor proves a good tool to study the spatial distribution and relaxation rate of trapped carriers in organic thin films transistors (Fig 2c). In particular, the non exponential type of decay of the persistent photo-conductivity in TFTs can be studied with improved sensitivity using a nanotube transistor as charge sensor.

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