STRESZCZENIE

AUTOR /nazwisko, imię /: Zbydniewska Ewa

TYTUŁ : Electronic Properties of Coupled Semiconductor Nanocrystals and Carbon Nanotubes

STRONY: 110

PROMOTOR /imię, nazwisko, tytuł nauk./: Mariusz Zdrojek, dr hab., Thierry Mélin, dr hab.

STRESZCZENIE PRACY /14-16 wierszy/ Rodzaj pracy: doktorska ~~habilitacyjna~~

We study the electronic properties of coupled semiconductor nanocrystals and carbon nanotubes. We report measurements of single electron transfers between single CdSe colloidal nanocrystal coupled to a carbon nanotube field effect transistor at room temperature in ambient conditions. The measurements consist of nanotube current level monitoring as a function of time for fixed gate voltage. We observe a sequence of *high* - *low* currents (random telegraph signal) on time scales up to several seconds with *ms* sampling time. We attribute the two level current fluctuations to the transfer of single electron onto the nanocrystal. The probability of the occupation time τ at the *high* or *low* current state follows a power law of the form $P(\tau) \sim \tau^{-\alpha}$ where exponent α lies between 1.5 and 4 (typically close to 2.8). The observation suggests that the two-level current switching is similar to the fluorescence intermittency (optical blinking) observed in individual quantum dots. The spectroscopic analysis of the devices based on coupled semiconductor nanocrystals and carbon nanotubes is consistent with the charging of nanocrystal defect states with a charging energy of $E_c \sim 200$ meV. The approach developed here enables to probe the trap state dynamics in quantum dots in ambient air and room temperature from a purely electrical approach, and therefore to better understand the physics at hand in (opto)electronic devices based on quantum dots.