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Voltage dependent capacitance – a measure of energy level bending in naphthalene-tetra-carboxylic- di-imide based transistors MATHIAS NYMAN, OSKAR SANDBERG, Abo Akademi University, JOSUE MARTINEZ HARDIGREE, SRINIVAS KOLA, HOWARD KATZ, The Johns Hopkins University, RONALD OSTERBACKA, Abo Akademi University — We demonstrate transient capacitance measurements using charge extraction by a linearly increasing voltage (CELIV) on the small molecule naphthalene-tetra-carboxylic- di-imide (NTCDI) based organic transistors. The OFETs use Aluminum (Al) and Aluminum Oxide (AlO_x) as bottom gate and dielectric, with gold (Au) source and drain electrodes. The Al/AlO_x gate is modified using two different self assembled monolayers, triethoxy(octyl)silane and perfluorooctyltriethoxysilane, in order to tune the turn-on voltage. We have clarified the voltage dependent capacitance in diode structures and found that when the transistor is in the fully on state a charge reservoir is formed at the AlO_x interface and a saturation of the steady-state capacitance is seen, equaling the capacitance of the AlO_x layer. When the transistor is in the fully off state the steady state capacitance saturates to the capacitance of the semiconductor bulk. We interpret this as a build-up of a charge reservoir in the semi conductor bulk when going from the off to the on state making it possible to charge the AlO_x capacitance. By going from the on state towards the off state using a linearly increasing voltage pulse the dynamics of the depletion of the reservoir gives information about the energy level bending in the bulk.

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