Oligothiophenes derivatives for optoelectronic applications Synthesis, mesomorphic behavior and charge transport properties

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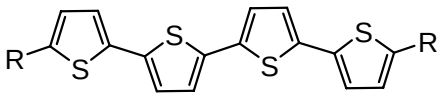
Since the discovery of the fast electronic transport of charge carriers in discotic and smectic Pi-conjugated liquid crystalline organic semi-conductors, increasing attention and intensive research efforts have been undertaken towards synthesis of new thermotropic pi-conjugated liquid crystals, and the measurements of their charge carrier transport properties [1]. One of the commonly used techniques to investigate the charge transport properties is the time-of-flight (TOF) technique, allowing a direct determination of effective drift mobilities of electrons and holes.

Different oligothiophenes derivatives were synthesized by Still coupling method. Alkyl groups of different chains lengths (8,10,12,) were used as terminal groups to quaterthiophenes derivatives.



R = C_8H_{17}
$C_{10}H_{21}$
$C_{12}H_{25}$

Obtained compounds possess mesomorphic properties which were characterized by differential scanning calorimetry (DSC) and polarization microscopy measurements. Observations evidenced presence of highly ordered thermotropic mesophases. Time-Of-Flight experiments with the use of the hot-stage and dye impulse laser (UV region) were performed to investigate the mobility of the newly synthesized molecules in their different phases (crystalline, mesophase, isotropic) in order to compare the charge carriers transport in different boundary conditions.

All oligothiophenes derivatives compounds exhibited an ordered smectic phase, as confirmed by hot-stage polarizing microscope analysis. TOF measurements have shown large carrier mobilities of the order of 10^{-2}-10^{-1} cm^2 / V.s.

References

(1) S. Ponomarenko, S. Kirchmeyer, *J. Mater. Chem.*, **2003**, *13*, 197-202.