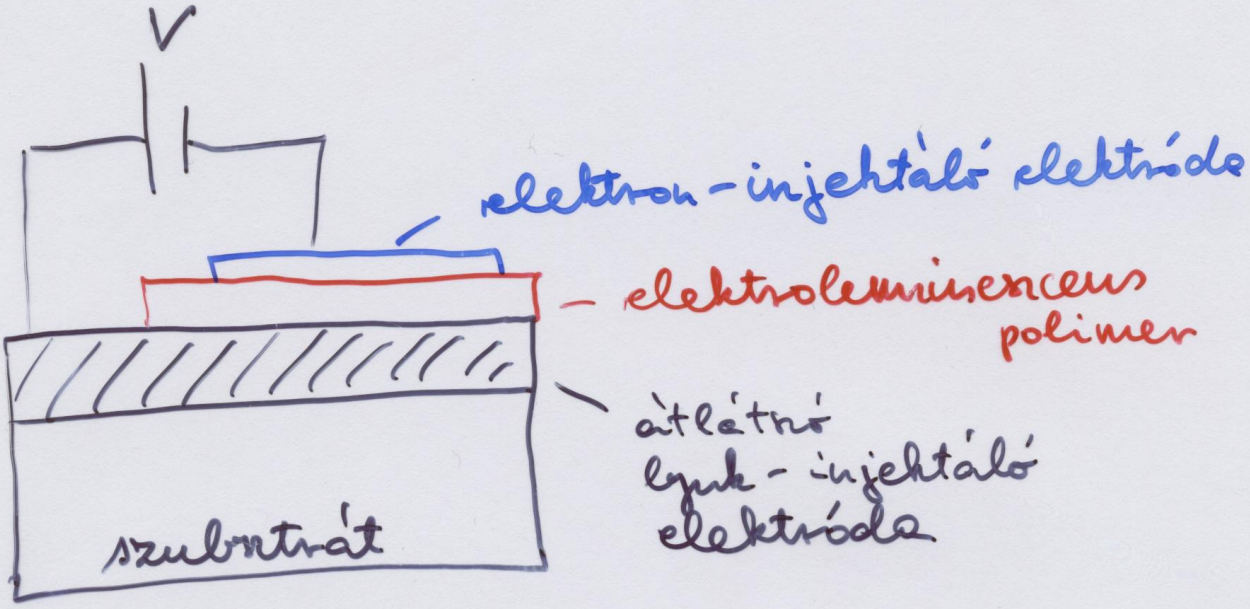
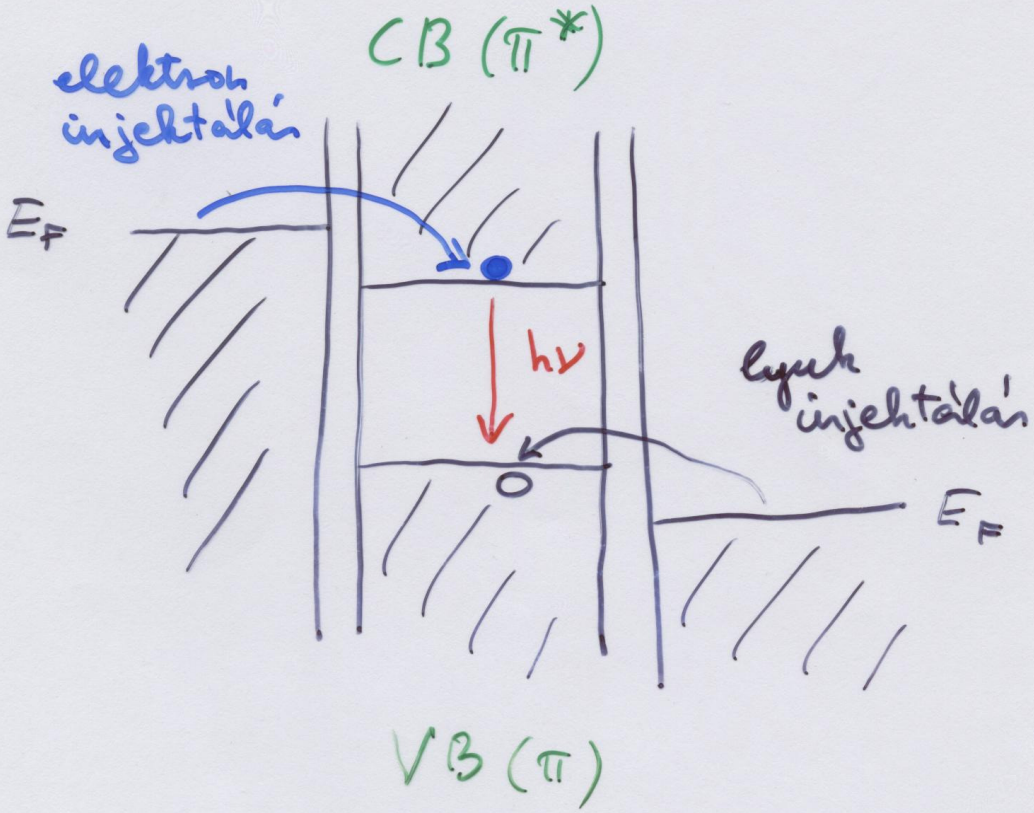
Konjugált polimerek alkalmazási lehetőségei

- elektromos (hajlékony vezető, antisztatikus fólia ... MISFET ...)
- elektrokémiai (gomb - akku)
- optikai (termokrón, LED ...)
- nemlineáris optikai („fotonika", hiperpolarizálhatóság ...)
- „egzotikus" pl. molekuláris elektronikai

O – LED

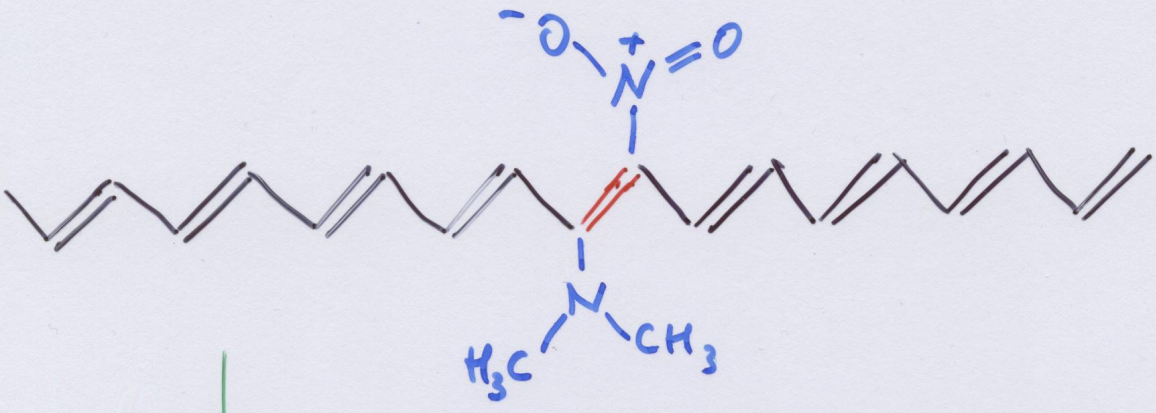
Organic Light Emitting Device

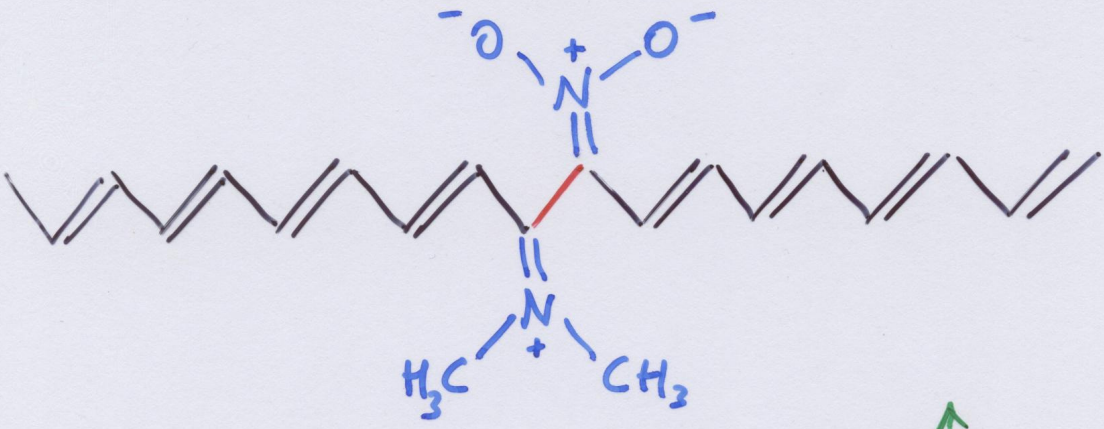


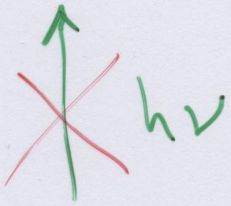


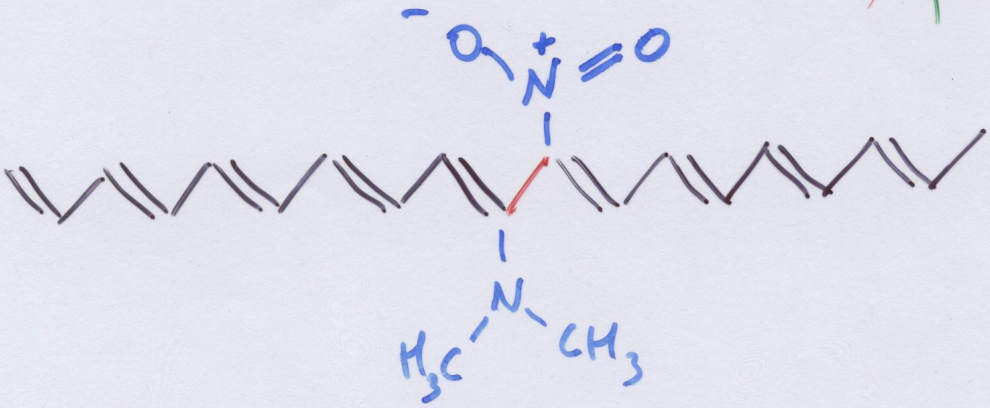
"Molekuláris elektronikai áramok"

F.L. Carter, 1982

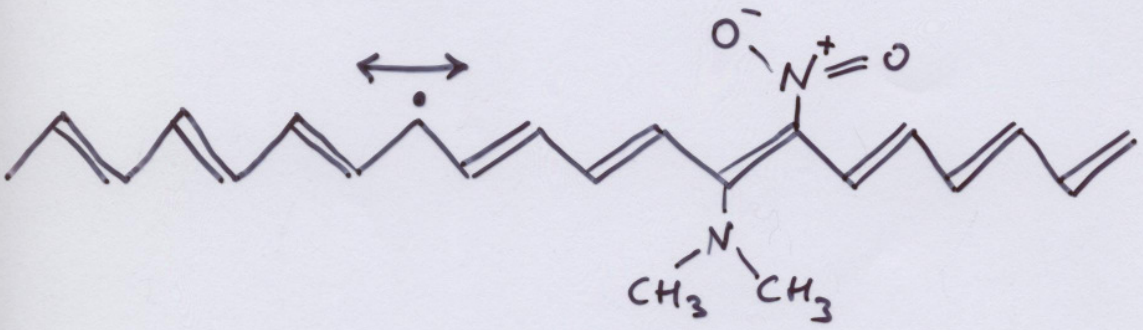




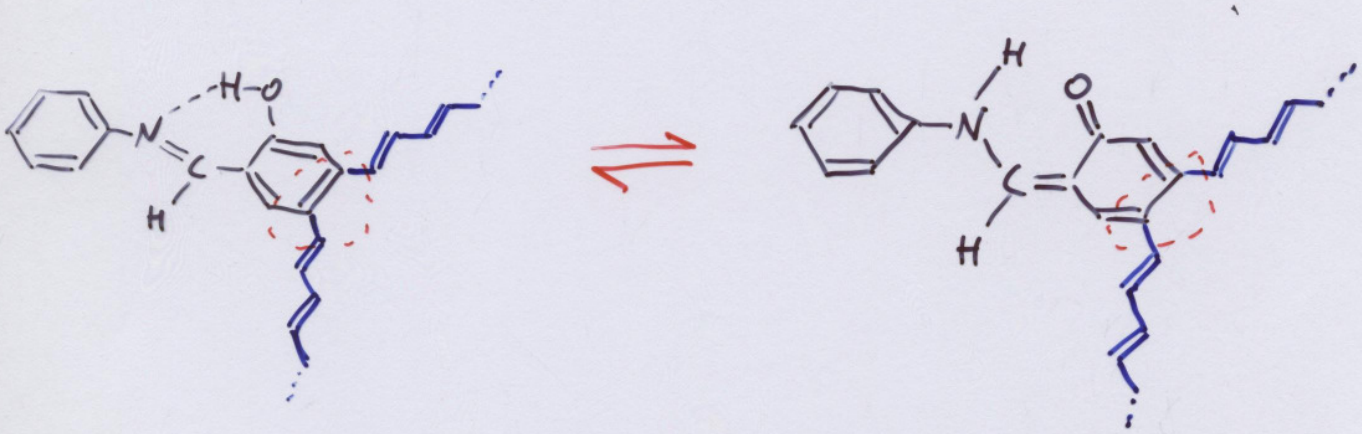




„ Molekuláris elektronikai álmok "



Carter, 198



N- salicyliden
fotokromm átmenete

Fitzl, Higelich, 19

Langmuir - Blodgett technika LB - fil

31. Addition of 1 weight % core material to a mantle source will have no effect on the isotopes of Sr, Nd, Pb, and oxygen, which are well correlated with Os isotopes in most OIBs [for example, Hawaii (*18*, *19*)]. Core-mantle interaction would also buffer the f_{O_2} of OIBs to the iron-wustite buffer, which is three to four orders of magnitude lower than f_{O_2}'s actually measured in OIBs [*Basaltic Volcanism Study Project* (Pergamon Press, New York, 1981)].
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Integrated Optoelectronic Devices Based on Conjugated Polymers

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An all-polymer semiconductor integrated device is demonstrated with a high-mobility conjugated polymer field-effect transistor (FET) driving a polymer light-emitting diode (LED) of similar size. The FET uses regioregular poly(hexylthiophene). Its performance approaches that of inorganic amorphous silicon FETs, with field-effect mobilities of 0.05 to 0.1 square centimeters per volt second and ON-OFF current ratios of $>10^6$. The high mobility is attributed to the formation of extended polaron states as a result of local self-organization, in contrast to the variable-range hopping of self-localized polarons found in more disordered polymers. The FET-LED device represents a step toward all-polymer optoelectronic integrated circuits such as active-matrix polymer LED displays.

Solution-processible conjugated polymers are among the most promising candidates for a cheap electronic and optoelectronic technology on plastic substrates. Polymer LEDs exceeding peak brightnesses of 10^6 cd m^{-2} (*1*) and high-resolution video polymer LED displays (*2*) have been demonstrated. One of the main obstacles to all-polymer optoelectronic circuits is the lack of a polymer FET with sufficiently high mobility and ON-OFF ratio to achieve reasonable switching speeds in logic circuits (*3*) and to drive polymer LEDs.

Conjugated polymer FETs (*4*) typically show field-effect mobilities of $\mu_{FET} = 10^{-6}$ to 10^{-4} cm^2 V^{-1} s^{-1}, limited by variable-range hopping between disordered polymer chains and ON-OFF current ratios of $<10^4$ (*5*). This is much too low for logic and display applications, and therefore all previous approaches to drive polymer LEDs have used polycrystalline (*2*) or amorphous silicon (a-Si) (*6*) technology. Recently, a polymer FET with a mobility of 0.01 to 0.04 cm^2 V^{-1} s^{-1} and an ON-OFF ratio of 10^2 to 10^4 using regioregular poly(hexylthiophene) (P3HT) was described (*7*). The high mobility is related to structural order in the polymer film induced by the regioregular head-to-tail (HT) coupling of the hexyl side chains. However, a clear understanding of the transport mechanism giving rise to the relatively high mobilities is still lacking.

Here, we report a considerably improved P3HT FET reaching mobilities of 0.05 to 0.1 cm^2 V^{-1} s^{-1} and ON-OFF ratios of $>10^6$, the performance of which starts to rival that of inorganic a-Si FETs and enables us to demonstrate integrated optoelectronic polymer devices. As an example, we have chosen a simple pixel-like configuration in which the FET supplies the current to a polymer LED. This allows us to assess the prospects of active-matrix addressing in all-polymer LED displays.

To construct the multilayer device (Fig. 1A), we first fabricated the FET by spin-coating a film of P3HT (500 to 700 Å) (*8*) onto a highly doped n^+-Si wafer with a 2300 Å SiO_2 gate oxide (capacitance C_i = 15 nF cm^{-2}). Au source-drain contacts were deposited onto the P3HT through a shadow mask. Then, a layer of SiO_x was thermally evaporated through another, mechanically aligned, shadow mask to define the active LED area on the finger-shaped Au FET drain electrode acting as the hole-injecting anode of the LED. A single layer of poly[2-methoxy-5-(2′-ethyl-hexyloxy)-*p*-phenylene-vinylene] (MEH-PPV) was spin-coated on top. Evaporation of a semitransparent Ca-Ag cathode completed the device. No photolithographic steps were involved. The device

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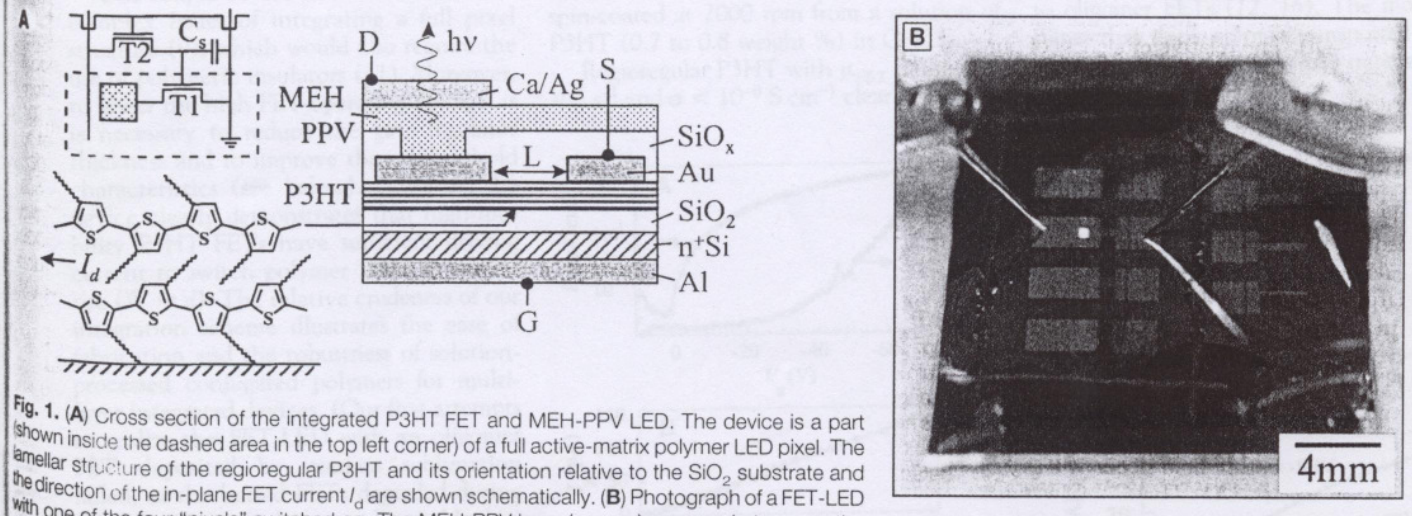

Fig. 1. (**A**) Cross section of the integrated P3HT FET and MEH-PPV LED. The device is a part (shown inside the dashed area in the top left corner) of a full active-matrix polymer LED pixel. The lamellar structure of the regioregular P3HT and its orientation relative to the SiO_2 substrate and the direction of the in-plane FET current I_d are shown schematically. (**B**) Photograph of a FET-LED with one of the four "pixels" switched on. The MEH-PPV layer (orange) was made to cover the substrate only partially in order to make the underlying (blueish) P3HT layer visible.