Chiral light detection via a chiral organic semiconductor transistor

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Supplementary information

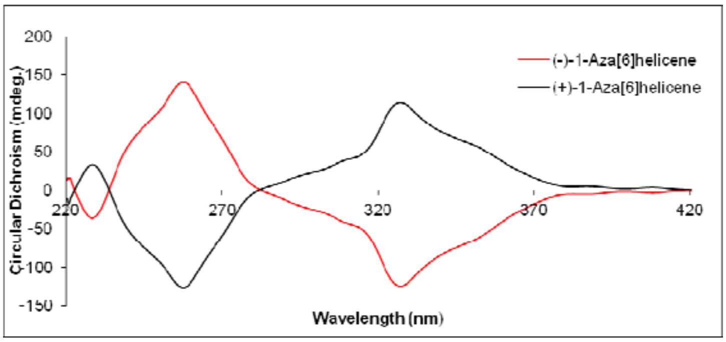

Figure S1: Circular dichroism (CD) spectra of the (+)- and (-)-1-aza[6]helicene enantiomers in dichloromethane (2.0×10^{-4} M), with a cuvette path length of 2 mm at room temperature.

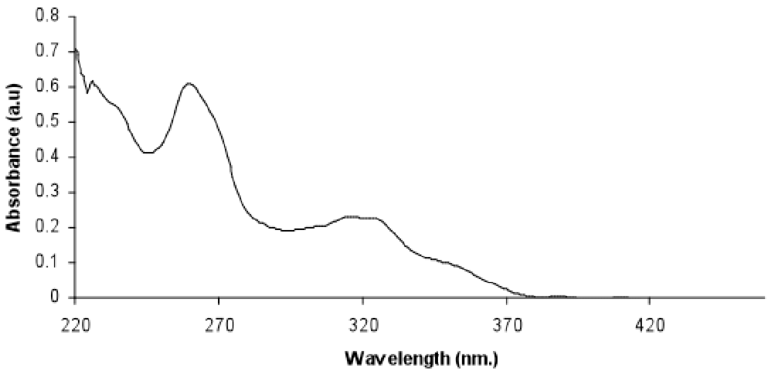

Figure S2: Absolute absorption spectrum of (+)-1-aza[6]helicene in dichloromethane (10 μM).

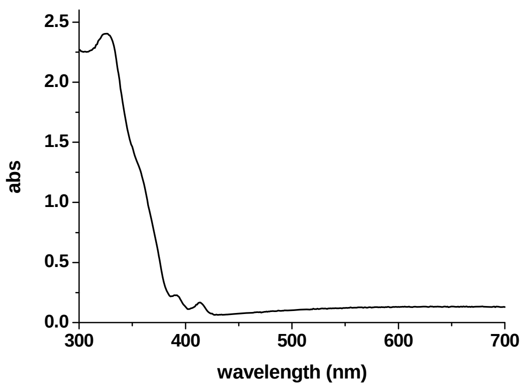

Figure S3: Absolute absorption spectrum of the (+)-1-aza[6]helicene thin films as used for the OFETs.

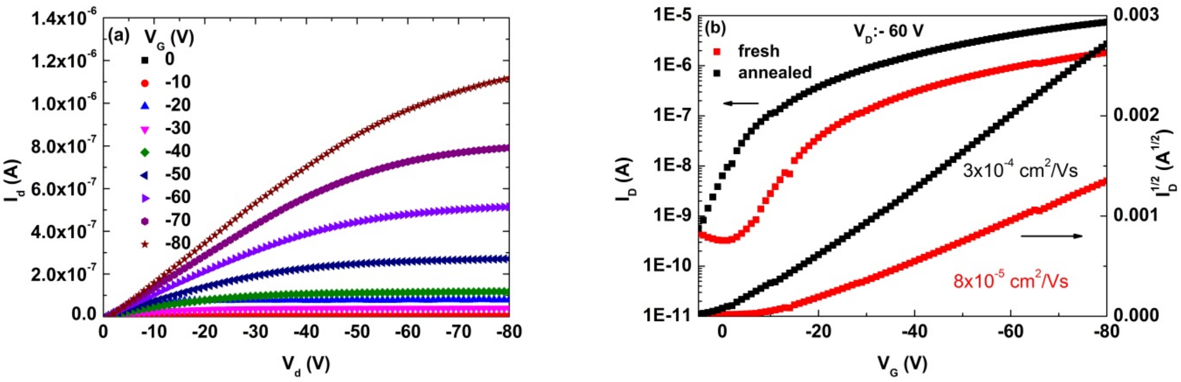

Figure S4: (a) Output characteristics of an annealed device (recorded at gate voltages V_G between 0 V and -80 V) and (b) transfer characteristics (recorded at a drain voltage V_D = -60 V) of fresh (red squares) and annealed (black squares) (-)-1-aza[6]helicene OFETs.

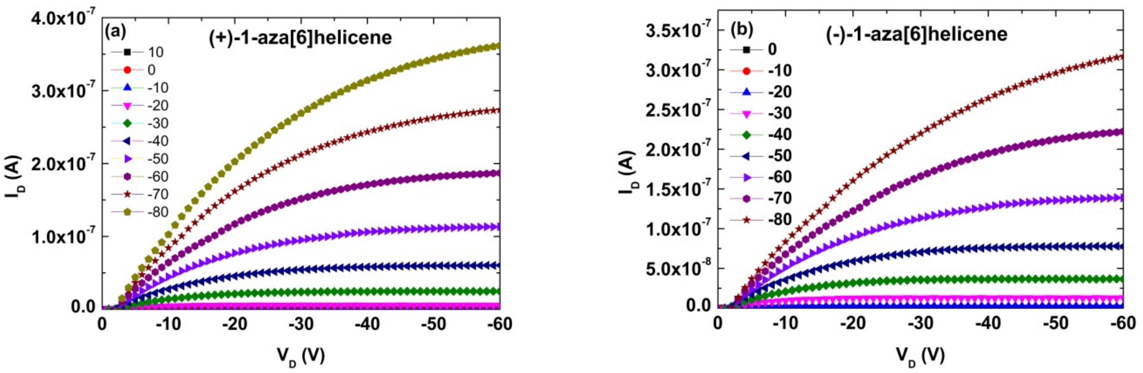

Figure S5: Output characteristics of (a) (+)-1-aza[6]helicene OFET under right-handed CP exposure and (c) (-)-1-aza[6]helicene OFET under left-handed CP exposure (recorded at gate voltages V_G between 10 V and -80 V).

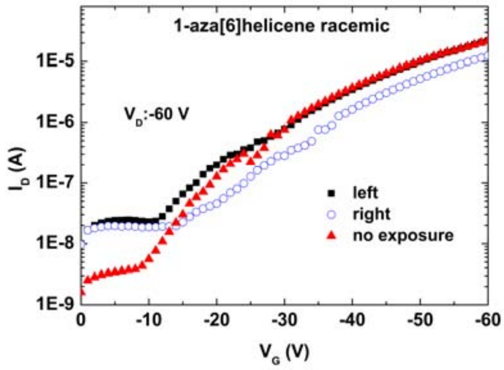

Figure S6: Transfer characteristics (at a drain voltage V_D = -60 V) of an annealed racemic 1-aza[6]helicene OFET under left-handed (black squares), right-handed (blue circles), and in the absence of (red triangles) CP illumination.

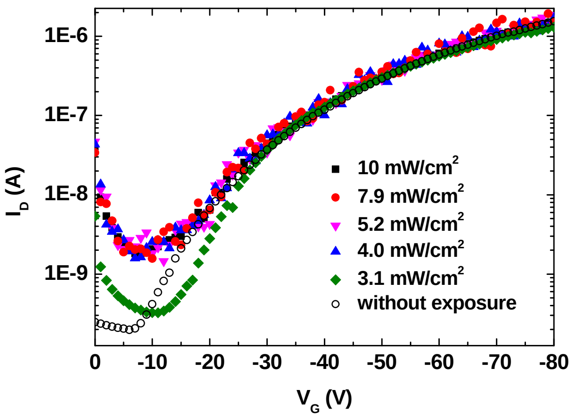

Figure S7: Transfer characteristics (recorded at a drain voltage V_D = -60 V) of an annealed (+)-1-aza[6]helicene OFET under UV illumination at different intensities up to 10 mW/cm^2.

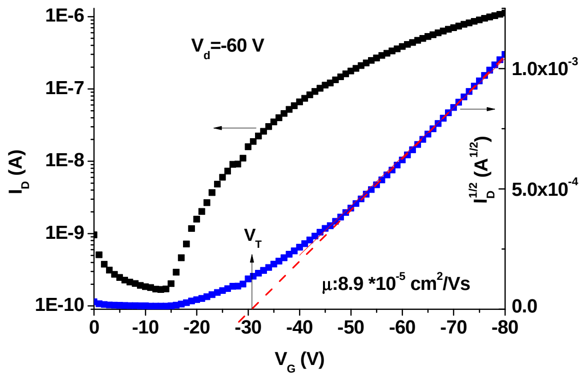

Figure S8: Transfer characteristics of a helicene OFET showing I_D *vs* V_G (black squares) and $\sqrt{I_{DSAT}}\, vs V_G$ (blue squares). Line (dashed red) is fit of $\sqrt{I_{DSAT}}\, vs V_G$ data to Equation (SE2) below. Arrow indicates value of V_T for this transistor.

Extraction of the device mobility and threshold voltage in the saturation regime

In the saturation regime ($V_D > (V_G - V_T)$):

$$I_{DSAT} = \frac{W\mu_{SAT}C_i}{2L}(V_G - V_T)^2 \qquad \text{(SE1)}$$

where V_D, V_G, V_T, I_{DSAT}, μ_{SAT} and C_i are the drain voltage, gate voltage, threshold voltage, saturation regime drain current, saturation regime mobility and insulator capacitance per unit area, respectively. Therefore:

$$\sqrt{I_{DSAT}} = \sqrt{\mu_{SAT}}\sqrt{\frac{WC_i}{2L}}(V_G - V_T) \qquad \text{(SE2)}$$

The mobility μ_{SAT} can be extracted from the slope of a plot of $\sqrt{I_{DSAT}}$ vs V_G using:

$$\mu_{SAT} = \left(\frac{\partial\sqrt{I_{DSAT}}}{\partial V_G}\right)^2 \frac{2L}{WC_i} \qquad \text{(SE3)}$$

V_T can be found from the intercept with the V_G axis. This is illustrated in Figure S8.