

## Anion exchange: an effective doping method for oriented polymer semiconductors in organic thermoelectrics

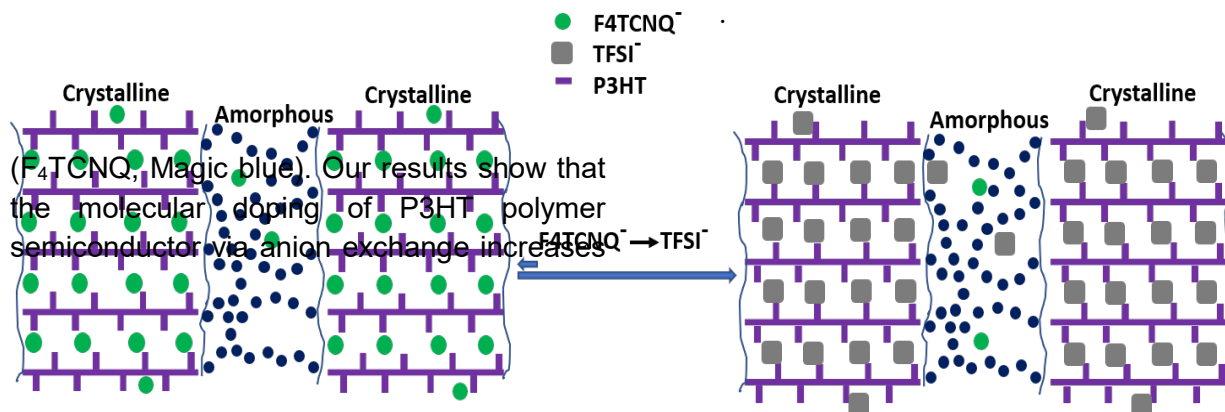
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**ABSTRACT:** Anion exchange is an original and effective doping method of interest in organic electronics as it helps reach high doping levels, hence, high charge transport properties and chemical stability of the doped organic semiconductors. This process is defined as the effective instantaneous exchange of a small molecular dopant anion with another anion from a dopant electrolyte. We want to explore this technique in the frame of thermoelectrics on oriented regioregular P3HT films. We have evaluated the impact of anion exchange on the structure and the thermoelectric properties of aligned P3HT films oriented by high temperature rubbing and compare the results with other known dopants

the conductivity as well as the power factor beyond the values found for F<sub>4</sub>TCNQ-doping. Preliminary results show that 1450 S/cm can be obtained by anion exchange in the chain direction. Electron diffraction demonstrates that TFSI dopant molecules enter the crystalline regions of the P3HT polymer similarly to F<sub>4</sub>TCNQ and F<sub>6</sub>TCNNQ. This is in contrast to Magic blue showing the highest conductivity and power factor for which MB is located exclusively in amorphous zones. Overall, anion exchange is an effective doping protocol for oriented thin film thermoelectrics with enhanced stability versus F<sub>4</sub>TCNQ and MB.



**Figure: Doped P3HT microstructures: Anion exchange doping with F<sub>4</sub>TCNQ and LiTFSI of the crystalline domains of oriented regioregular P3HT**

**KEY WORDS:** Anion exchange, thermoelectrics, orientation, P3HT, chemical stability

### References

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