Electronic Supplementary Material (ESI) for Materials Horizons.

Supplemental Information

Magnetically Tunable Organic Semiconductors with Superparamagnetic Nanoparticles

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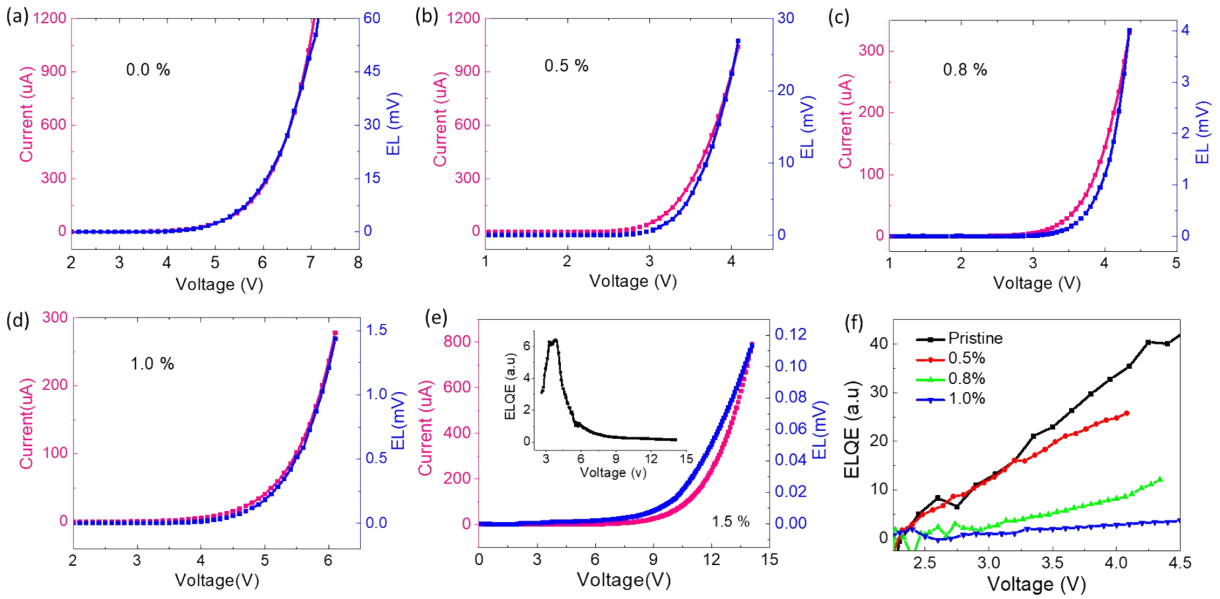

Figure S1. The current-voltage (IV) and EL-V characteristics of the devices with (a) 0.0 %, (b) 0.5 %, (c) 0.8 %, (d) 1.0 %, and (e) 1.5% MNP concentration at room temperature, (f) Electroluminescence quantum efficiency (ELQE defined by EL/I) versus applied voltage. The data was processed from parts a-d. The ELQE of 1.5% MNP device is plotted in the inset of (e).

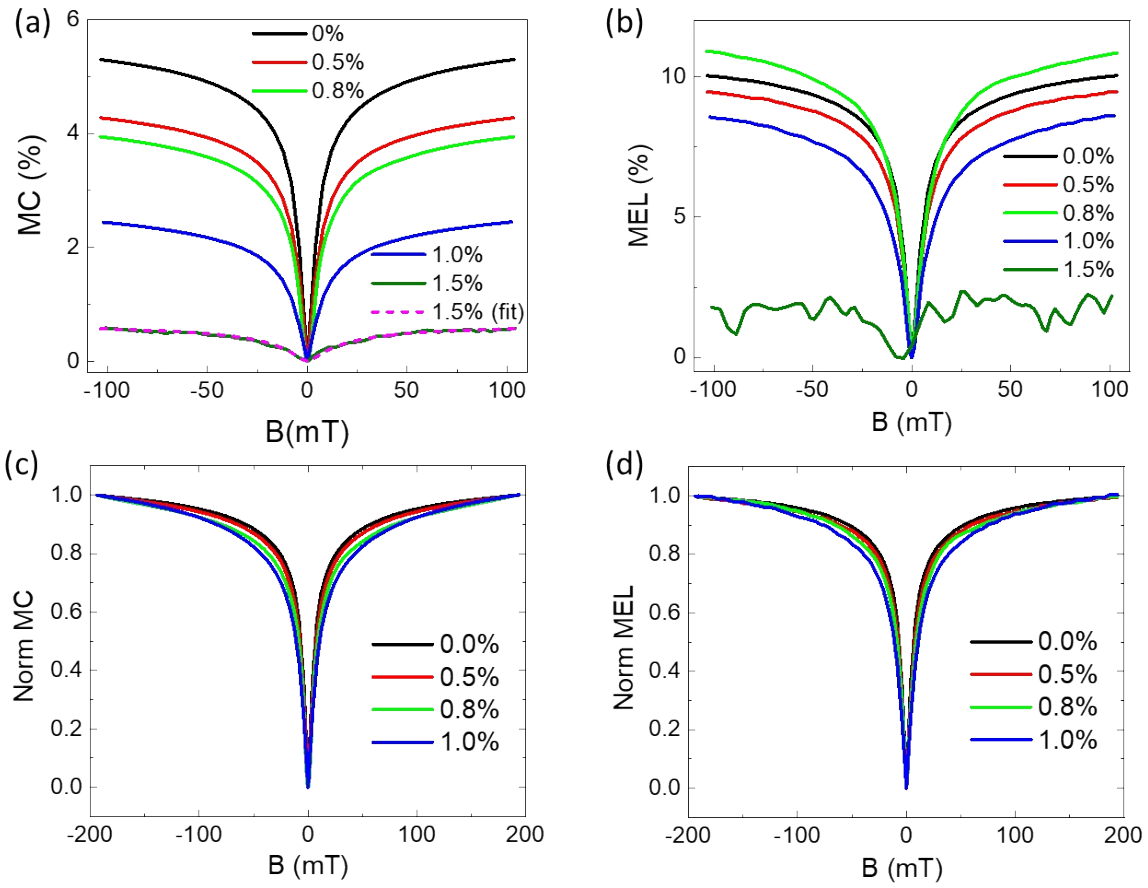

Figure S2. Magnetic field effect of the OLEDs with different concentrations of MNPs at 300 K. (a) MC response and (b) MEL response with the concentration dependence with magnetic field range of 100 mT. Normalized (c) MC and (d) MEL with magnetic field range of 200 mT.

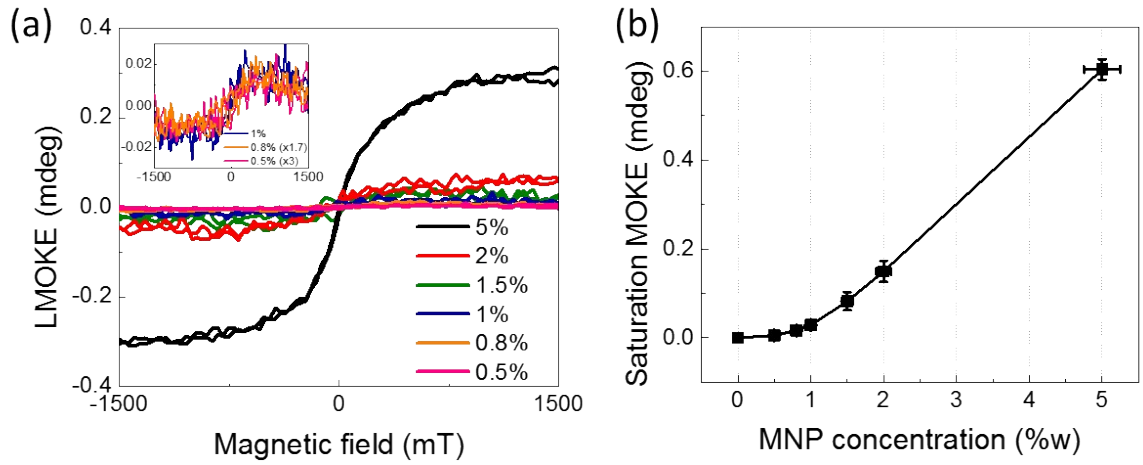

Figure S3. (a) MOKE hysteresis curve of SU8/MNP thin film with different concentration of MNPs. Inset: zoom-in of MOKE hysteresis curve with low concentration of MNP of 1% and 0.5%. (b) Saturation MOKE signal versus concentration of MNPs (%w) with error bars.

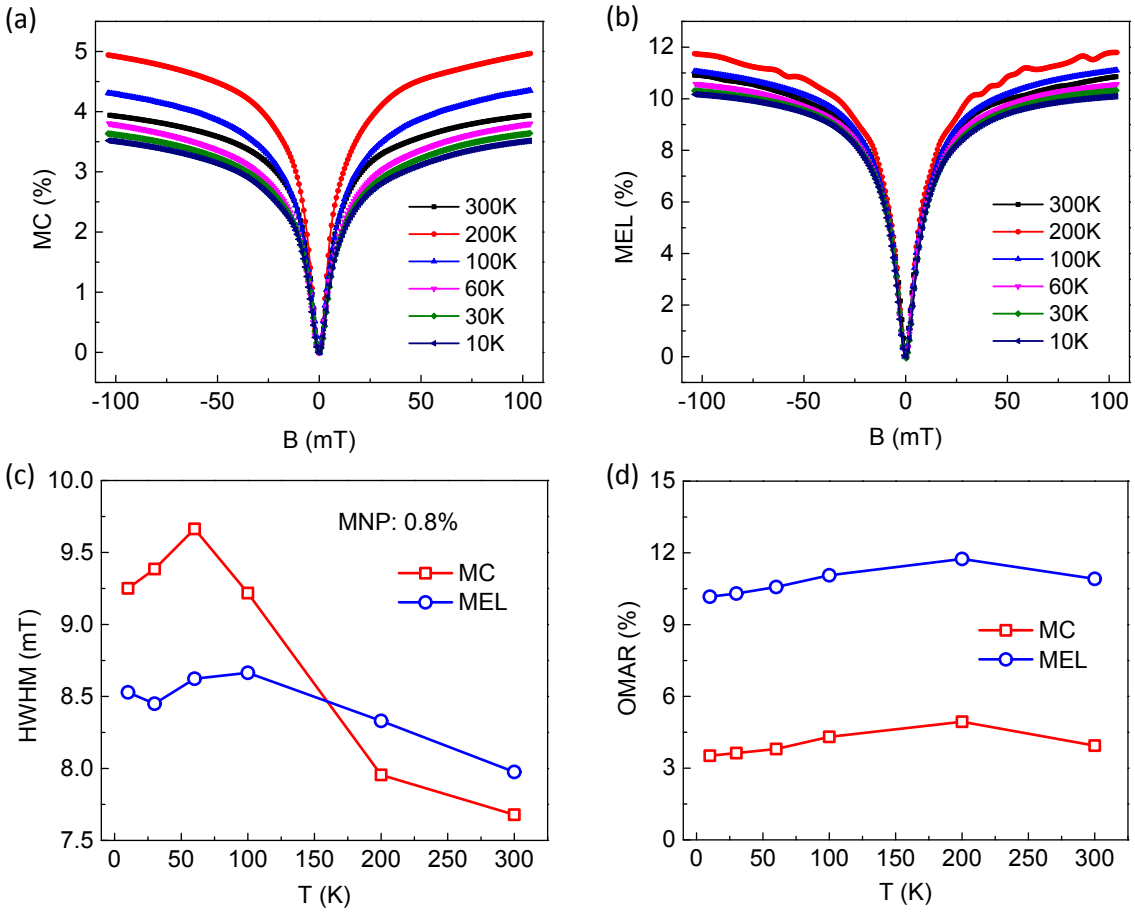

Figure S4. Magnetic field effect of the blend OLED with 0.8% MNP at different temperatures. (a) MC responses and (b) MEL responses with temperature dependence. (c) Half-width of half maximum (HWHM) and (d) the magnitude of MC and MEL responses with temperature dependence.

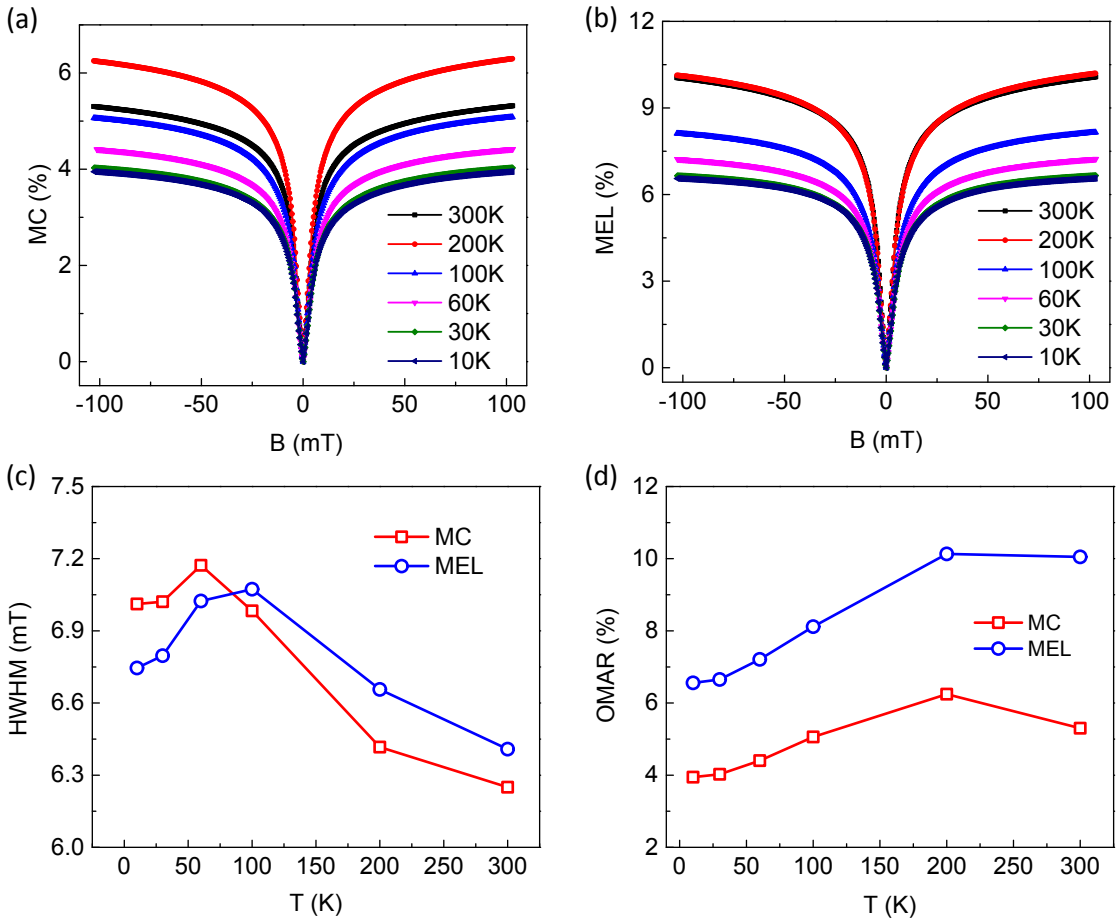

Figure S5. Magnetic field effect of the pristine OLED at different temperatures. (a) MC responses and (b) MEL responses with temperature dependence. (c) Half-width of half maximum (HWHM) and (d) the magnitude of MC and MEL responses with temperature dependence.

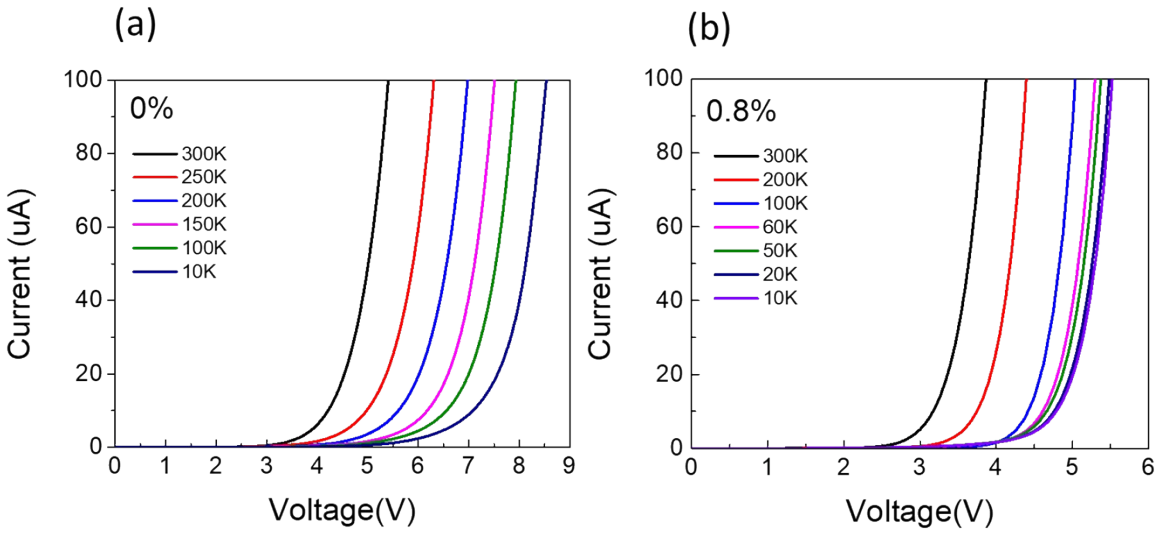

Figure S6. Typical temperature dependence of current density in (a) pristine and (b) 0.8% MNP based OLEDs.

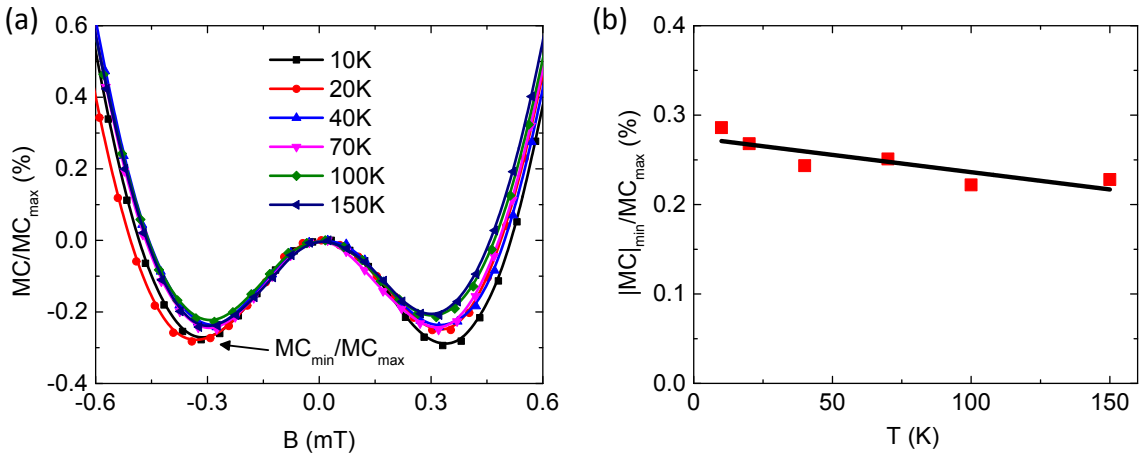

Figure S7. MC response of a pristine OLED at the ultra-small magnetic field. (a) Normalized MC response at the ultra-small magnetic field with temperature dependence. (b) $|MC|_{min}/MC_{max}$ at different temperatures, where the data points (red square) is linearly fitted (black line).

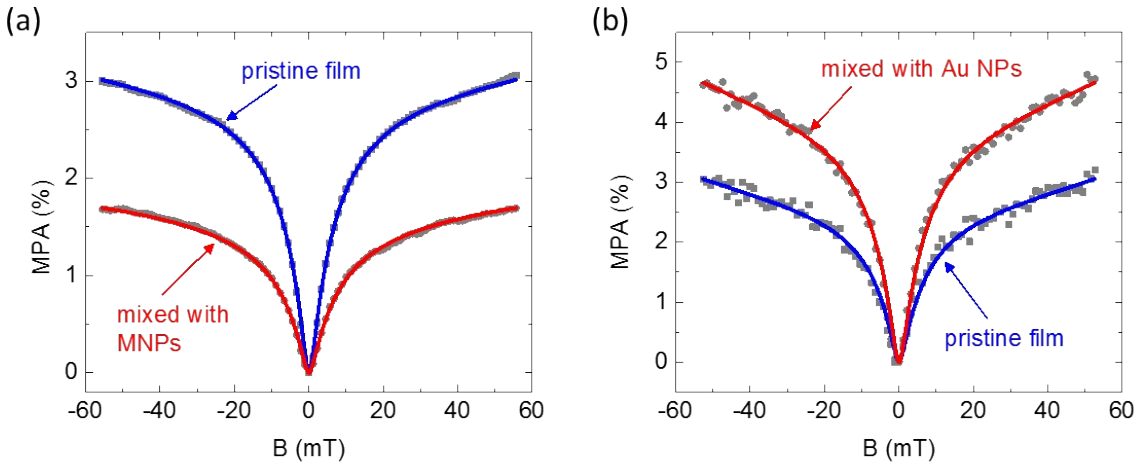

Figure S8. Magneto photo-induced absorption (MPA) measurement of the pristine MeH-PPV films and films blended with nanoparticles. (a) MPA of a pristine film and the film blended with 1% Fe_3O_4 MNPs. (b) MPA of a pristine film and the film blended with 1% Au nanoparticles (10 nm in diameter). The MPA data are fitted by using a double-Lorentzian function, and the fitting results are the blue and red curves in (a) and (b). The purpose of the fitting is to have smooth curves for the comparison shown in the main text. We did not aim to compare the fitting parameters since it is not the scope of this report. It is worth noting that the MPA magnitude of the film with Au nanoparticles is larger than that in the pristine film, in contrast to the MPA of the film with MNPs. The enhancement of MPA in the Au containing film might be due to the strong localized surface plasmon resonance at the Au nanoparticles.