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Optimising the hyperfluorescence photophysical pathways for the next generation of OLED displays.

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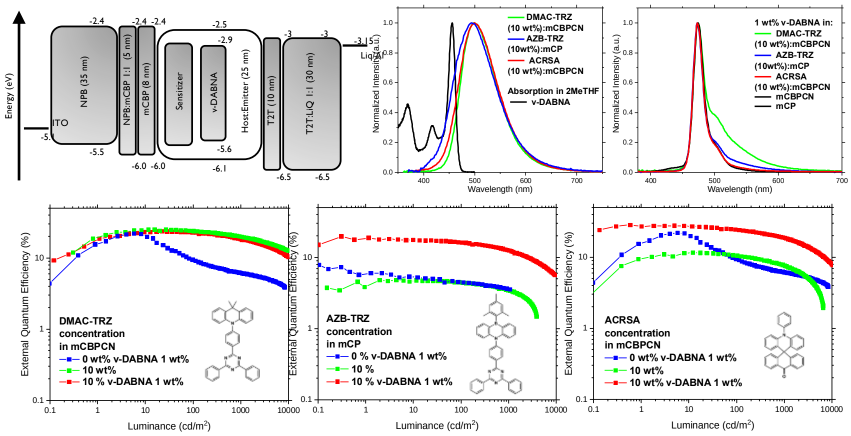
Deep blue hyperfluorescent OLEDs can provide an ideal solution for displays,[1] giving narrow linewidth emission for saturated colours at very high efficiency. We have investigated different TADF triplet sensitisers with the hyperfluorescence emitter v-DABNA,[2] to obtain maximum efficiency, limit parasitic spectral broadening and v-DABNA excimer formation, whilst at the same time minimising the triplet energies of both host and sensitiser to improve device lifetimes.

We discover the key optical properties for the TADF triplet up-conversion sensitisers required for optimal energy transfer to the v-DABNA, retaining very high FRET efficiency at low v-DABNA concentrations and small singlet energy gap between the sensitiser and v-DABNA. Three different sensitisers were studied, DMAC TRZ,[3] a very efficient TADF material and two rather poor TADF materials, ACRSA [4] and AZB-TRZ, [5] Figure 1.



For ACRSA we achieve a 3 fold increase in EQE, >28% from the hyperfluorescent devices compared to the pure ACRSA devices, which is higher than the DMAC-TRZ hyperfluorescent devices. From our results we find that the most important photophysical parameters for sensitisation are different to those for optimal TADF, so the best TADF molecules are not the best for sensitisation. We elucidate the key factors to present new design rules specifically for TADF sensitiser molecules.[6]

REFERENCES

1. Monkman, A. *ACS Appl. Mater. Interfaces* **14**, 20463 (2022).
2. Stavrou, K., Danos, A., Hama, T., Hatakeyama, T. & Monkman, A. *ACS Appl. Mater. Interfaces* **13**, 8643 (2021).
3. Stavrou, K. *Franca, L. G., Böhmer, T., Duben, L. M., Marian, C. M., Monkman, A., Adv. Funct. Mater.* **33**, 2300910, (2023)
4. Franca, L. G., Danos, A. & Monkman, A. *J. Phys. Chem. Lett.* **14**, 2764 (2023).
5. Sudhakar, P. *Suman,* Stavrou, K., Danos, A., *Slawin, A. M., Monkman, A., Zysman-Colman, E., ACS Appl. Mater. Interfaces* **15**, 25806 (2023).
6. Stavrou, K., Franca, L.G., Danos, A. & Monkman, A. *Nat. Photon.* **18**, 554, (2024).