On the temperature dependence of the quenching by a few defects of TADF materials. Triplet versus Singlet FRET.

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Thermally Activated Delayed Fluorescence (TADF) molecules contribute to the light emission of an optoelectronic device from both their singlet and triplet states. But the quenching limits these benefits. In the case of cationic (NHC)Cu(I) complexes bearing 2,2'-dipyridylamine[i] solids, we have studied the quenching mechanism, the exciton mobility and its energy transfer efficiency as a function of temperature. We can create defects in crystals of TADF molecules by a strong laser irradiation. The quenching efficiency by these defects depends on the temperature.

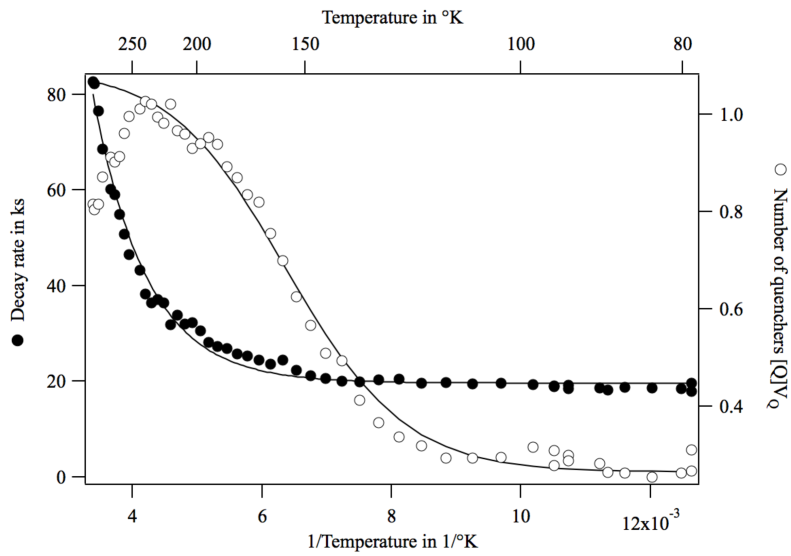

Figure 1 *The decay rate of the unquenched population ● depends on temperature because of the Boltzmann equilibrium between the Singlet and Triplet states. From that an energy difference between the two states can be measure to be 10kJ/mol. Below 240°K, the quenching volume decreases with the Singlet state contribution.*

This is because the repartition between the singlet and triplet states depends on the temperature and the singlet state is more prone to quenching through the FRET. From the analysis of the decay curves, we show that the excitons are not mobile in the crystal. We also show that the quenching is through FRET. We show that the quenching is due to the small number (<3) of defects inside the quenching volume. Using a time resolved version of the Perrin quenching model,[ii] we measure the average of this number that is reported on Fig.1.

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[i] M. Elie, et al. *ACS Appl Mater Interfaces,* **2016,** 8, 14678-91.

[ii] L. Hartmann, et al., *ACS Nano* , **2012**, 6, 9033–9041.