



Twist and Charge Transfer Modulation Towards Imidazo[1,2-a]pyridine Encapped Triazine DSEgen for Green Emission: TNP Sensing, Bioimaging & OLED Applications

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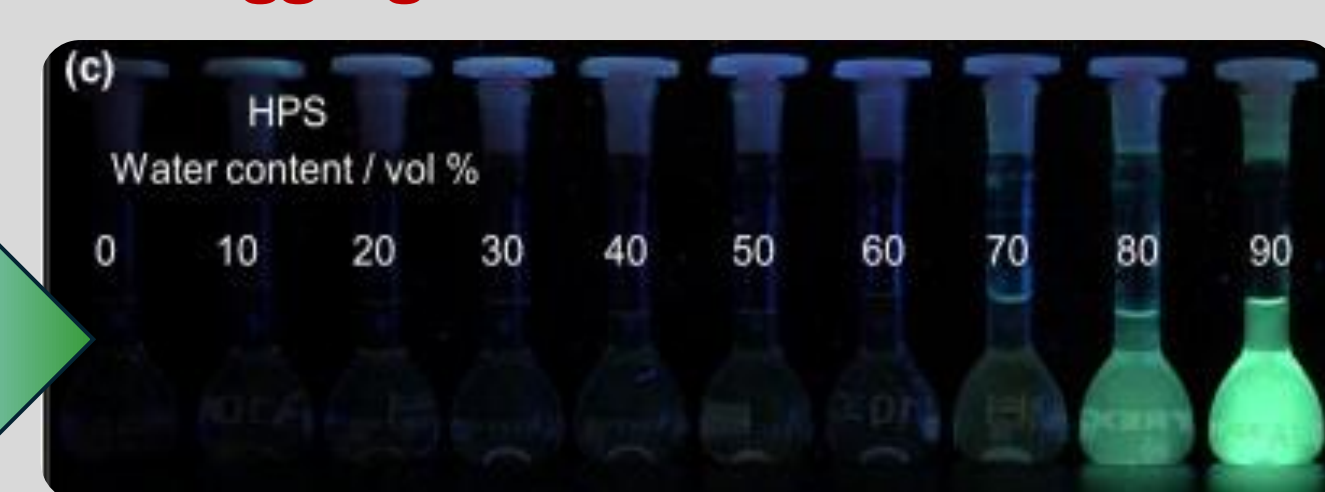
Luminescent molecules have become indispensable in our daily life. Particularly, photoluminescence has created a revolution in many scientific innovations and technological advancements

Many chromophores are fluorescent in solutions but become non-emissive when fabricated into thin solid films

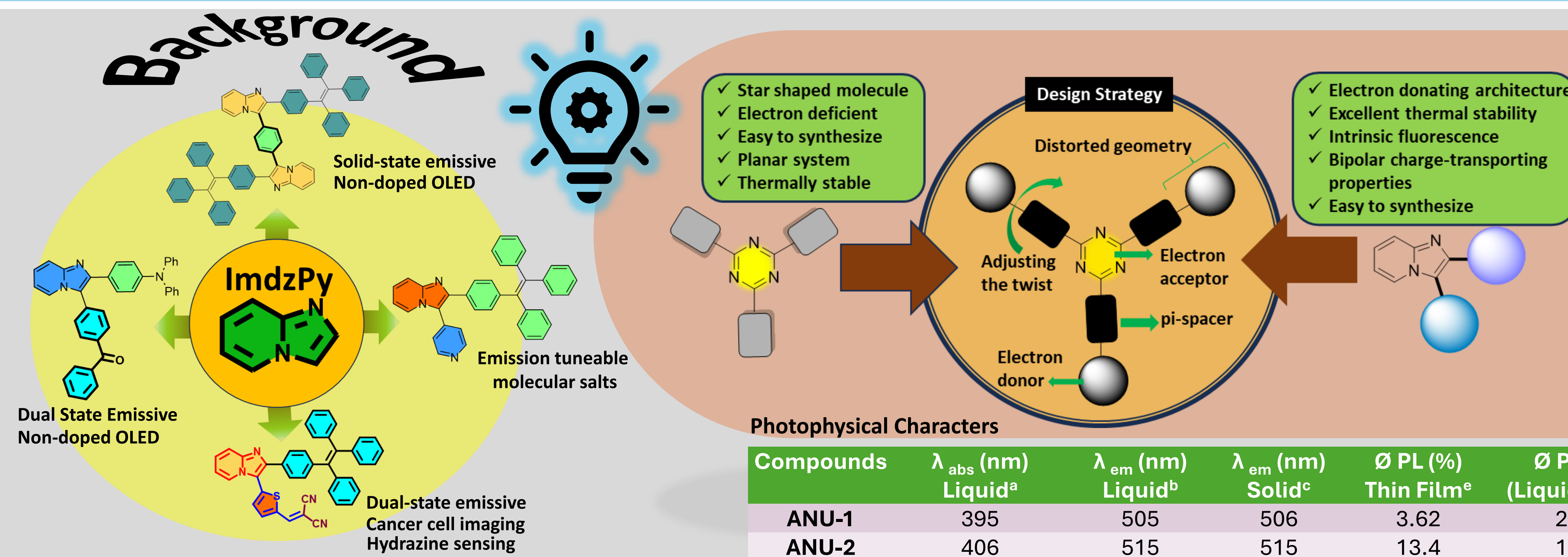
Aggregation Caused Quenching



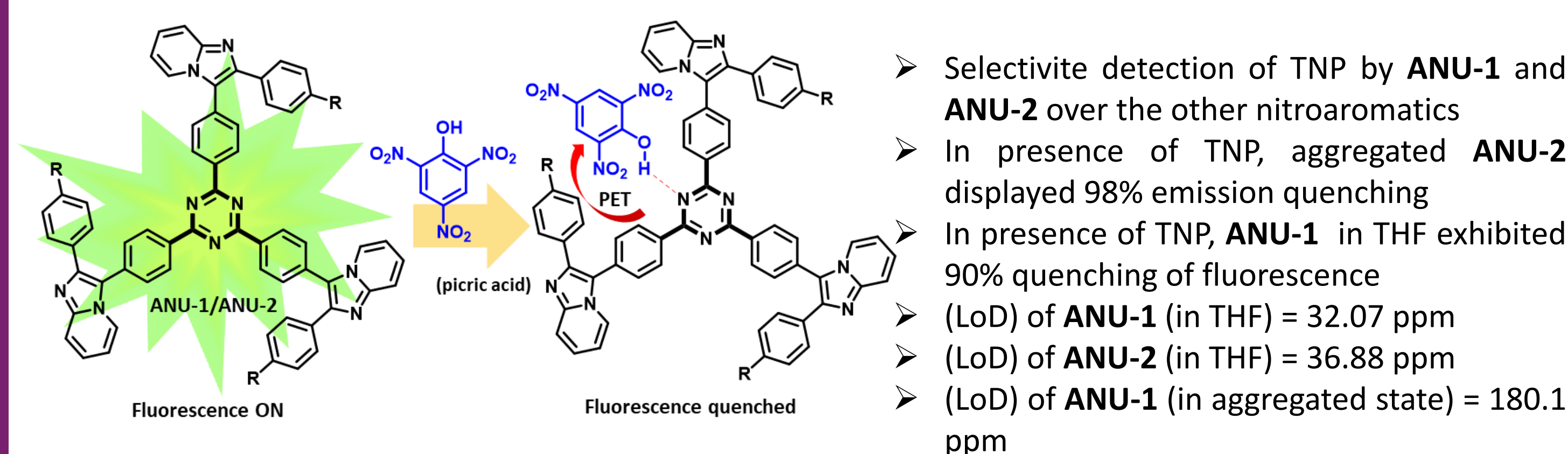
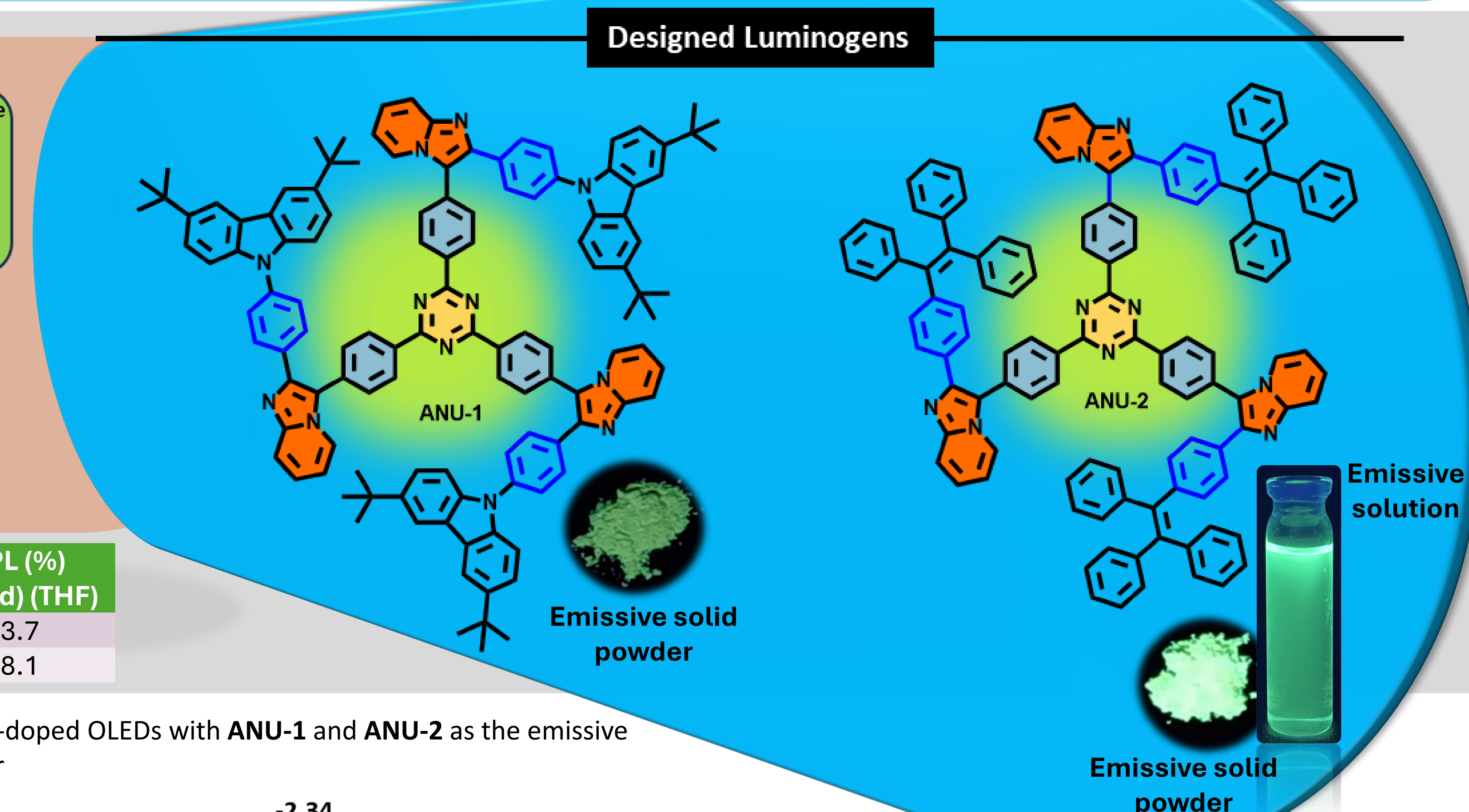
Aggregation Induced Emission



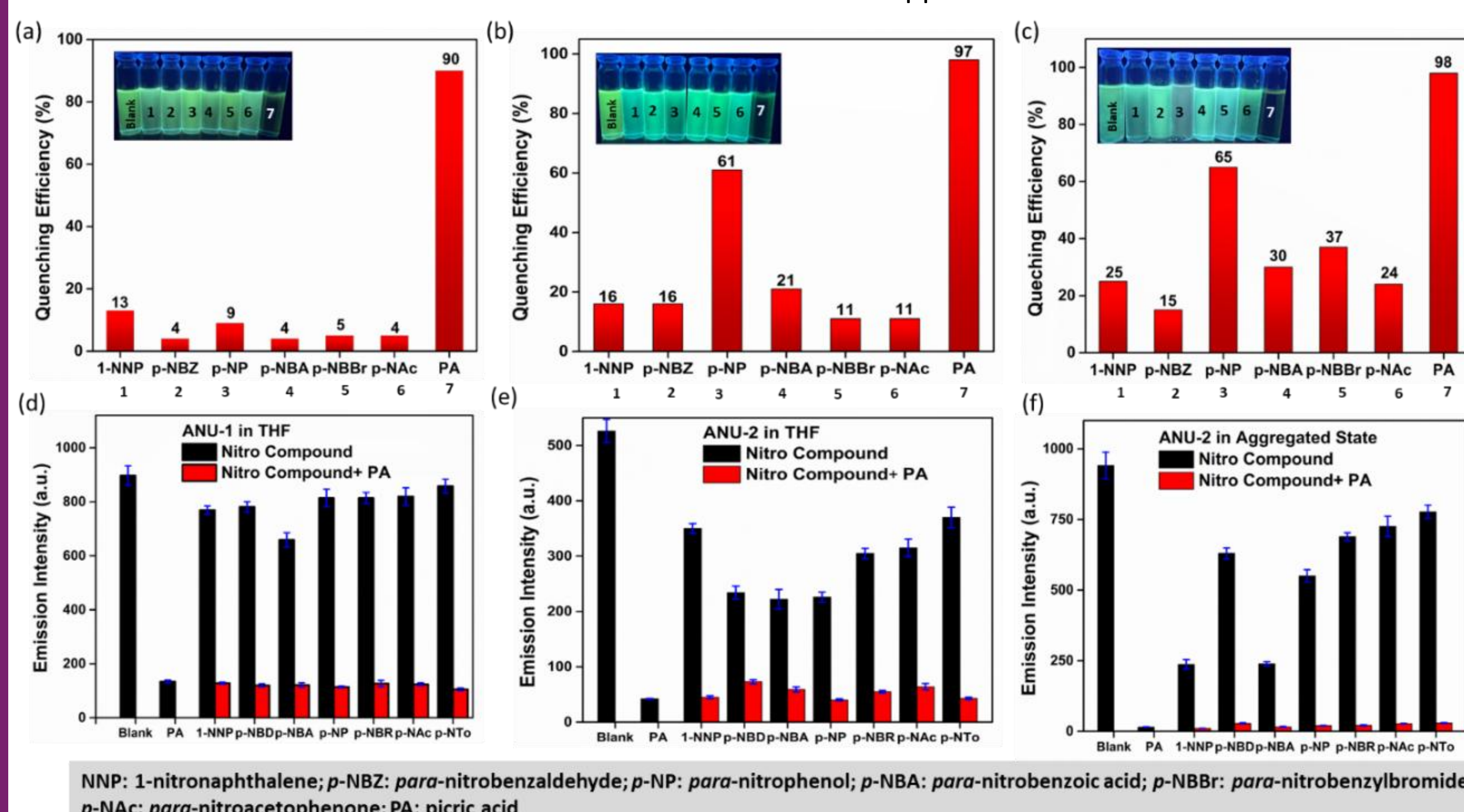
Applications of AIE in field of : OLEDs, Explosive Detection, Bio-imaging, Stimuli Responses, Fingerprint Visualization etc.



Compounds	λ_{abs} (nm) Liquid ^a	λ_{em} (nm) Liquid ^b	λ_{em} (nm) Solid ^c	Φ PL (%) Thin Film ^e	Φ PL (%) (Liquid) (THF)
ANU-1	395	505	506	3.62	23.7
ANU-2	406	515	515	13.4	18.1



- Selective detection of TNP by **ANU-1** and **ANU-2** over the other nitroaromatics
- In presence of TNP, aggregated **ANU-2** displayed 98% emission quenching
- In presence of TNP, **ANU-1** in THF exhibited 90% quenching of fluorescence (LoD) of **ANU-1** (in THF) = 32.07 ppm (LoD) of **ANU-2** (in THF) = 36.88 ppm (LoD) of **ANU-1** (in aggregated state) = 180.1 ppm

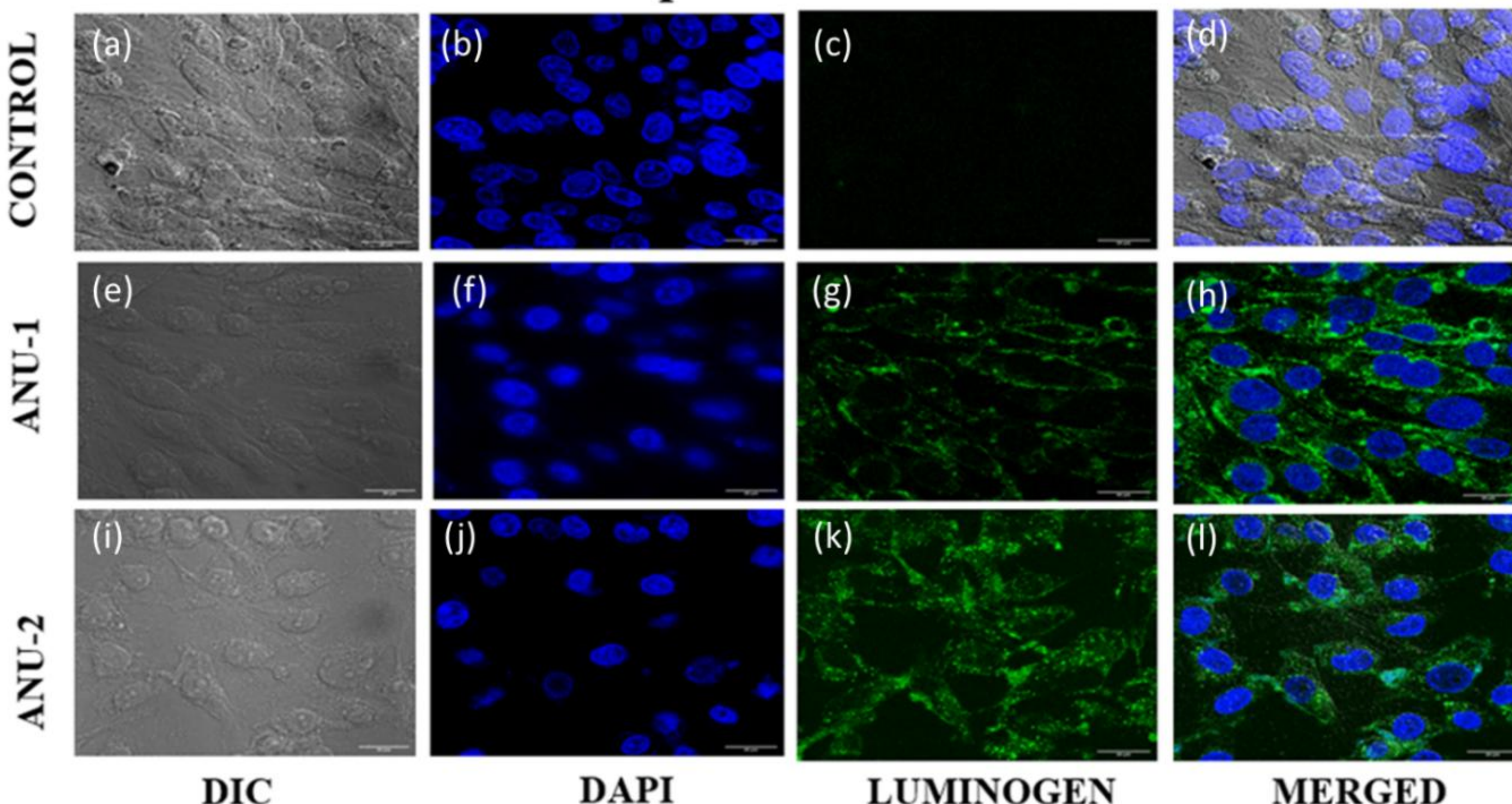


ANU-1 and **ANU-2** are found safe till 1 $\mu\text{g/ml}$ concentration, while **ANU-2** appears more toxic than **ANU-1**. The in vitro evaluation on HeLa cells demonstrated that **ANU-1** and **ANU-2** exhibit potent antiproliferative activity, successfully suppressing cell growth at concentrations as low as 0.1 $\mu\text{g/mL}$ concentration.

In vitro cellular uptake

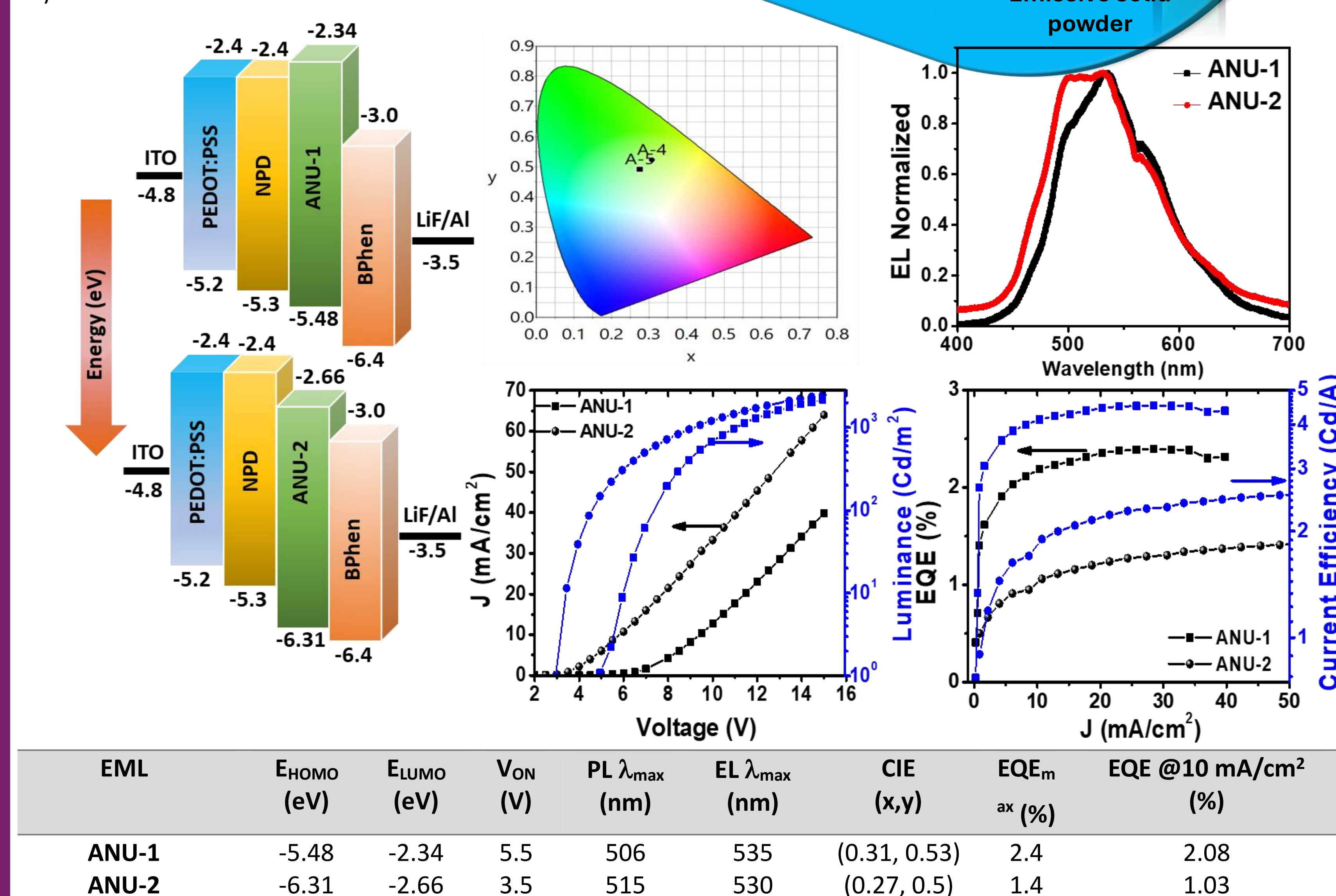
ANU-1 mainly outlined the cell-membrane after their intracellular penetration

ANU-2 uniformly distributed into the cytoplasm with high fluorescent intensity



ANU-1 and **ANU-2** can act as effective photosensitizers, capable of generating ROS upon light exposure

Non-doped OLEDs with **ANU-1** and **ANU-2** as the emissive layer



TNP sensing

Cell-imaging

OLED

Conclusions: **ANU-2** achieves dual-state emission (DSE) with high PLQY in both solution and solid states, while **ANU-1** exhibits strong solution-phase emission but suffers from ACQ. Selective TNP sensing by both **ANU-1** (in solution state) and **ANU-2** (both in solution and solid state) Generates ROS, hence having potential application in photodynamic therapy (PDT) **ANU-2** showing superior cytoplasmic localization and fluorescence intensity over **ANU-1** Potential emissive materials for non-doped OLEDs

References: 1. S. Saha et. al. *J. Mater. Chem. C.* **2025**, **13**, 3955-3968
2. S. Saha et. al. *J. Mater. Chem. C.* **2025**, **13**, 10576-10591
3. S. Saha et. al. *J. Mater. Chem. C.* **2025**, DOI: [10.1039/D5TC00389J](https://doi.org/10.1039/D5TC00389J)
4. S. Saha et. al. *J. Mater. Chem. C.* **2025**, (submitted)

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