Kyulux

Materializing the future of OLEDs

2025

EN

Kyulux Offers the Ultimate OLED emitter

The emitter material is where the OLED magic happens -where electrons combine with holes to create light. The OLED emitter is the most valuable and crucial part of the OLED stack.

Today's OLED makers rely on a hybrid emitter system, a combination of fluorescence and phosphorescence materials. Kyulux creates materials that represent the next step in emitter technology -delivering better performance at lower costs.

Fluorescence

Low Cost
Deep Blue Available
High Color Purity
Low Efficiency (25%)

1987

1st Gen

Phosphorescence

High Cost
Deep Blue - Currently Not Available
Low Color Purity
High Efficiency (100%)

2000

2nd Gen

2012

3rd Gen

TADF

Low Cost
Deep Blue
Low Color Purity
High Efficiency (100%)

2014

4th Gen

Hyperfluorescence™

Low Cost
Deep Blue - Most Promising
High Color Purity
High Efficiency (100%)

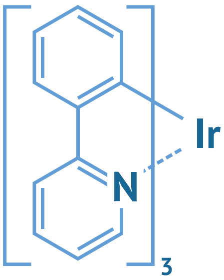
What is TADF?

Fluorescence (1G)

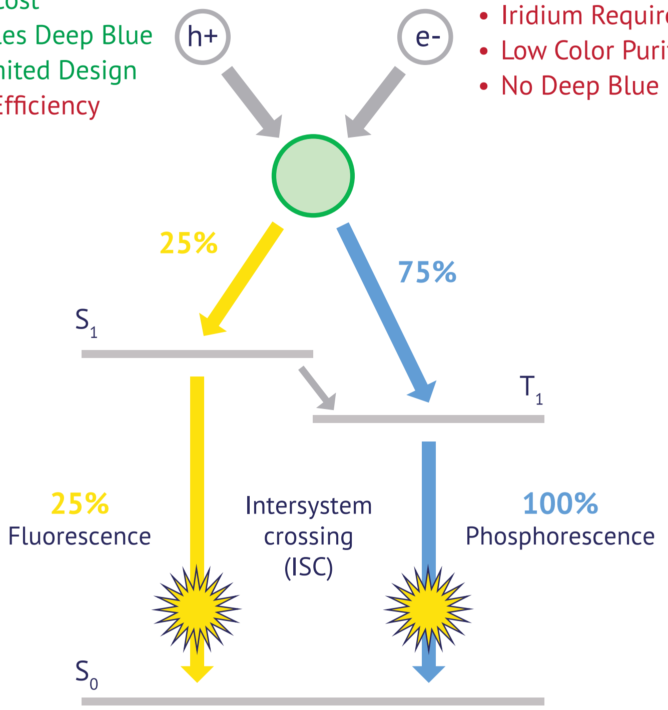
- High Color Purity
- Low Cost
- Enables Deep Blue
- Unlimited Design
- Low Efficiency

Phosphorescence (2G)

- High Efficiency
- Iridium Required
- Low Color Purity
- No Deep Blue



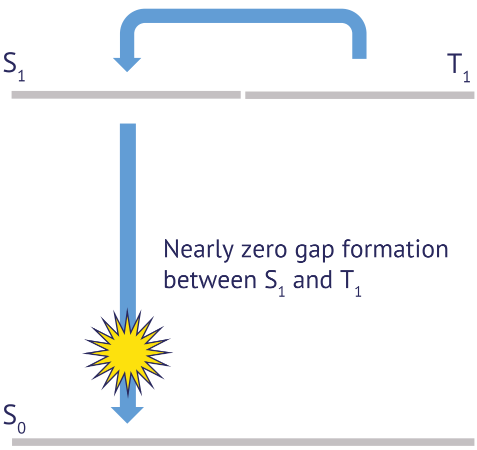
Baldo, et al. : Appl. Phys. Lett., 75, p.4 (1999)
Adachi, et al. : Appl. Phys. Lett., 77, p.904 (2000)



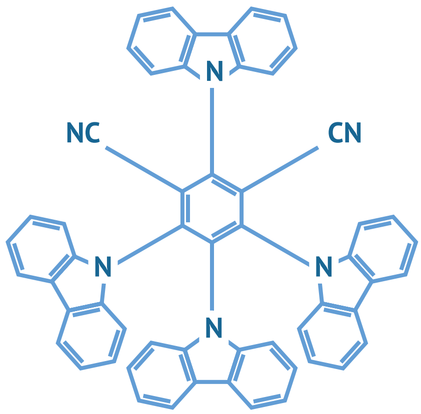
Conventional fluorescence and phosphorescence processes

TADF: Thermally Activated Delayed Fluorescence (3G)

- High Efficiency
- Low Cost
- Enables Deep Blue
- Unlimited Design
- Aromatic Compounds
- Low Color Purity



High efficiency thermally activated delayed fluorescence (TADF) via reverse intersystem crossing (RISC)



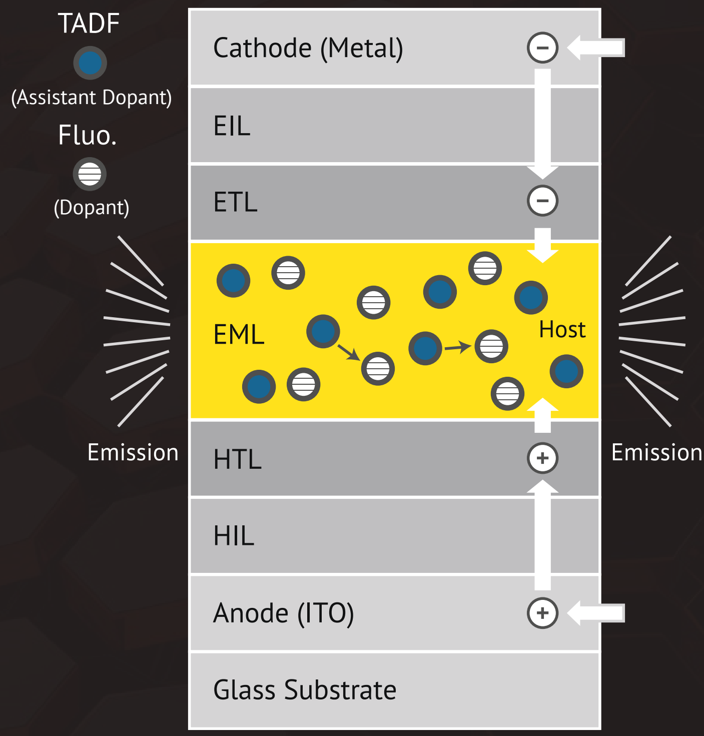
Nature, 492,234 (2012)

How does Hyperfluorescence™ (4G) Work?

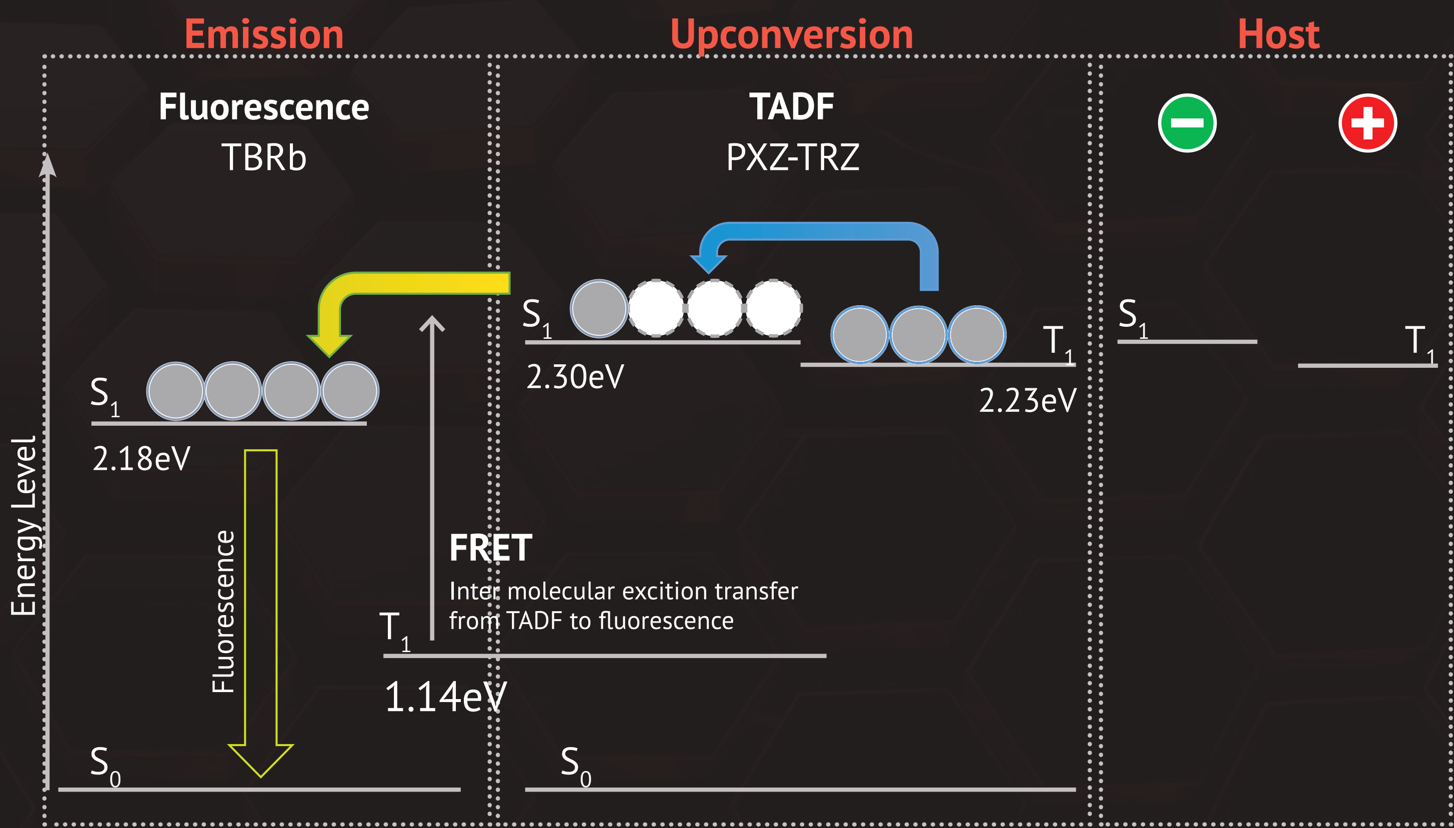
In Hyperfluorescence™, the emissive layer is comprised of host materials, TADF and fluorescence emitting materials. The TADF molecule generates excitons, and the Excited State Energy transfers to a fluorescent molecule. The fluorescent molecule then emits four times more Light than conventional fluorescence with the same input energy.

Hyperfluorescence™ provides the ultimate emission mechanism with high efficiency, high color purity and low cost - all without the use of rare metals.

Hyperfluorescence™ is the only practical solution for commercializing high efficient deep blue emission.

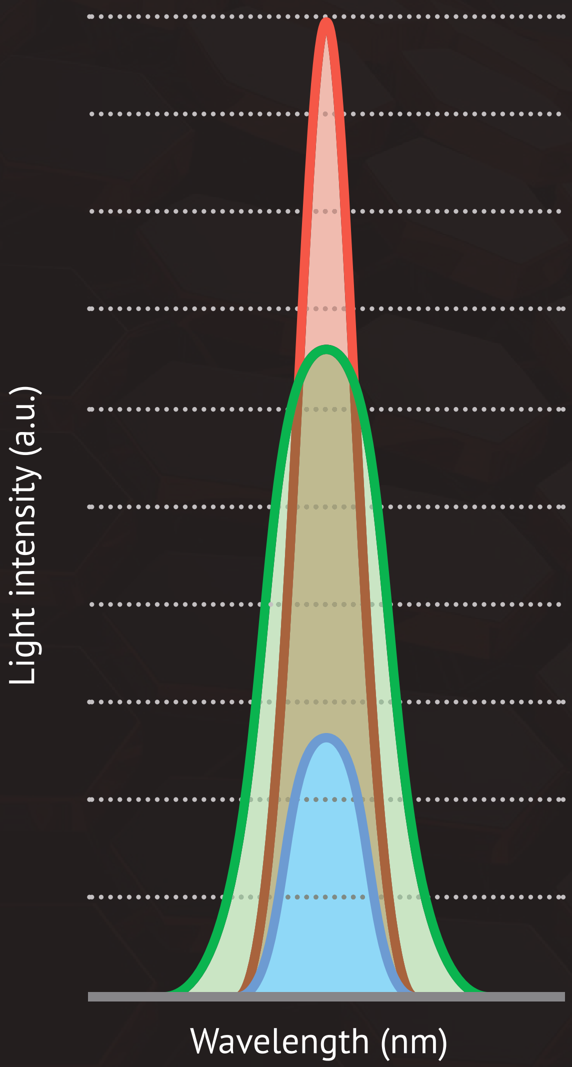


OLED Device Structure



H. Nakanotani, et al, Nat. Commun., 5, 4016, 2014

Hyperfluorescence™
The Future of OLED Technology



Hyperfluorescence™ (4G)

- Narrow spectrum
- High intensity

TADF (3G)
Phosphorescence (2G)

- Wider spectrum
- Medium intensity

Fluorescence (1G)

- Narrow spectrum
- Low intensity

Generation	Technology	Cost	Efficiency	Color Purity
1G	Fluorescence	Low	Low	High
2G	Phosphorescence	High	High	Low
3G	TADF	Low	High	Low
4G	**Hyperfluorescence™**	**Low**	**High**	**High**

Kyumatic™: Materials Informatics for Molecule Discovery

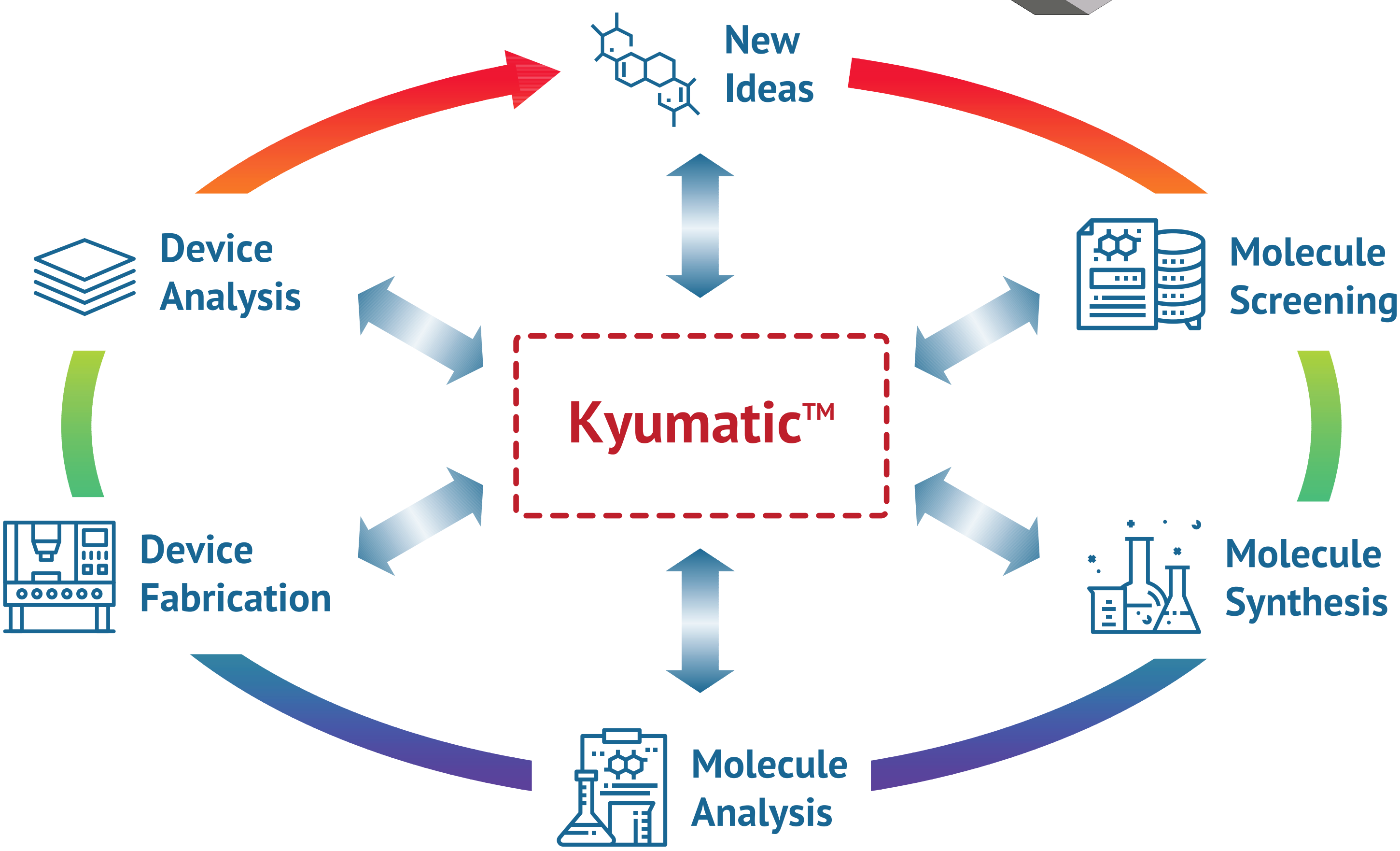
Kyumatic™ is an AI system that accelerates Kyulux's materials development process. After an exhaustive virtual screening of novel molecular ideas, Kyumatic™'s AI analyzes them and narrows them down to the most promising candidates.

Researchers then synthesize the final candidates, incorporate these into OLED devices, and test them.

This process shortens the time from concept to device implementation and testing to one to two months, a much shorter time than previously possible. Furthermore, by integrating the test results into Kyumatic™ and advancing AI learning, the prediction accuracy of material properties continues to improve, dramatically accelerating the speed of material development.

Kyumatic™ is a fully integrated, web-based Materials Informatics (MI) platform consisting of:

1. A high-throughput virtual screening system
2. A cloud-based quantum chemical calculation system
3. An AI-based property prediction (high-throughput virtual screening HTVS) system
4. A comprehensive data management & analysis system



Kyulux's collaboration with OPERA and i^3-opera

OPERA
Kyushu University

Cutting Edge and Fundamental Research

i^3-opera
Fukuoka City-Fukuoka Prefecture

Applied Research for Practical Development

Organic Photonics Device System Valley

Kyulux

Joint Research Project

Commissioned Development

Commercializing Hyperfluorescence™ and TADF

Accelerating material development and device optimization by utilizing clean rooms, state-of-art equipment owned by OPERA and i^3-opera

Kyulux OPERA i^3-opera

Kyulux'slongstanding collaboration with Kyushu University's OPERA and i^3-opera centers promotes the acceleration of materials commercialization.

Kyulux's Hyperfluorescence™/TADF material technology is licensed from Kyushu University, OPERA (Center for Organic Photonics and Electronics Research) focuses on cutting-edge fundamental research on organic photonics and electronics. OPERA top-notch researchers, equipped with state-of-the-art equipment, constantly work to create and characterize new innovative materials, films and devices.

i^3- opera is a non-profit research center supported by the local government, focused on applied research for practical development, to bridge the gap between academia research and industry. Kyulux's prosperous relationship with i^3-opera assists it in its quest to commercialize the cutting-edge Hyperfluorescence™ material technology.

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