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Photophysical investigation of furanyl-substituted PVK derivatives: Substitution Effects, Aggregation Behavior, and Solid-State Emission

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INTRODUCTION & AIM

Poly(9-vinylcarbazole) (PVK) is widely used as a polymer emitter, but it still has limitations due to excimer formation and π–π intermolecular interactions. To mitigate these effects, structural modifications such as the incorporation of burrowing and non-planar units, such as dibenzofuran, have been explored to disrupt molecular packing and reduce emission quenching.

METHOD

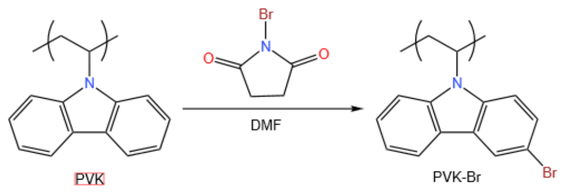


Figure 1 -Synthesis of PVK-Br from NBS ($C_4H_4BrNO_2$) activated in DMF solution.

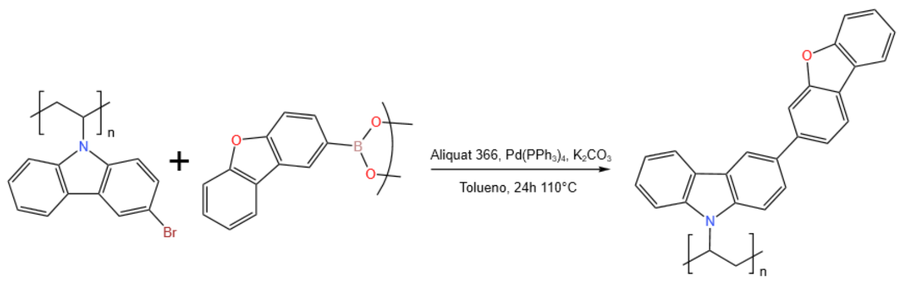
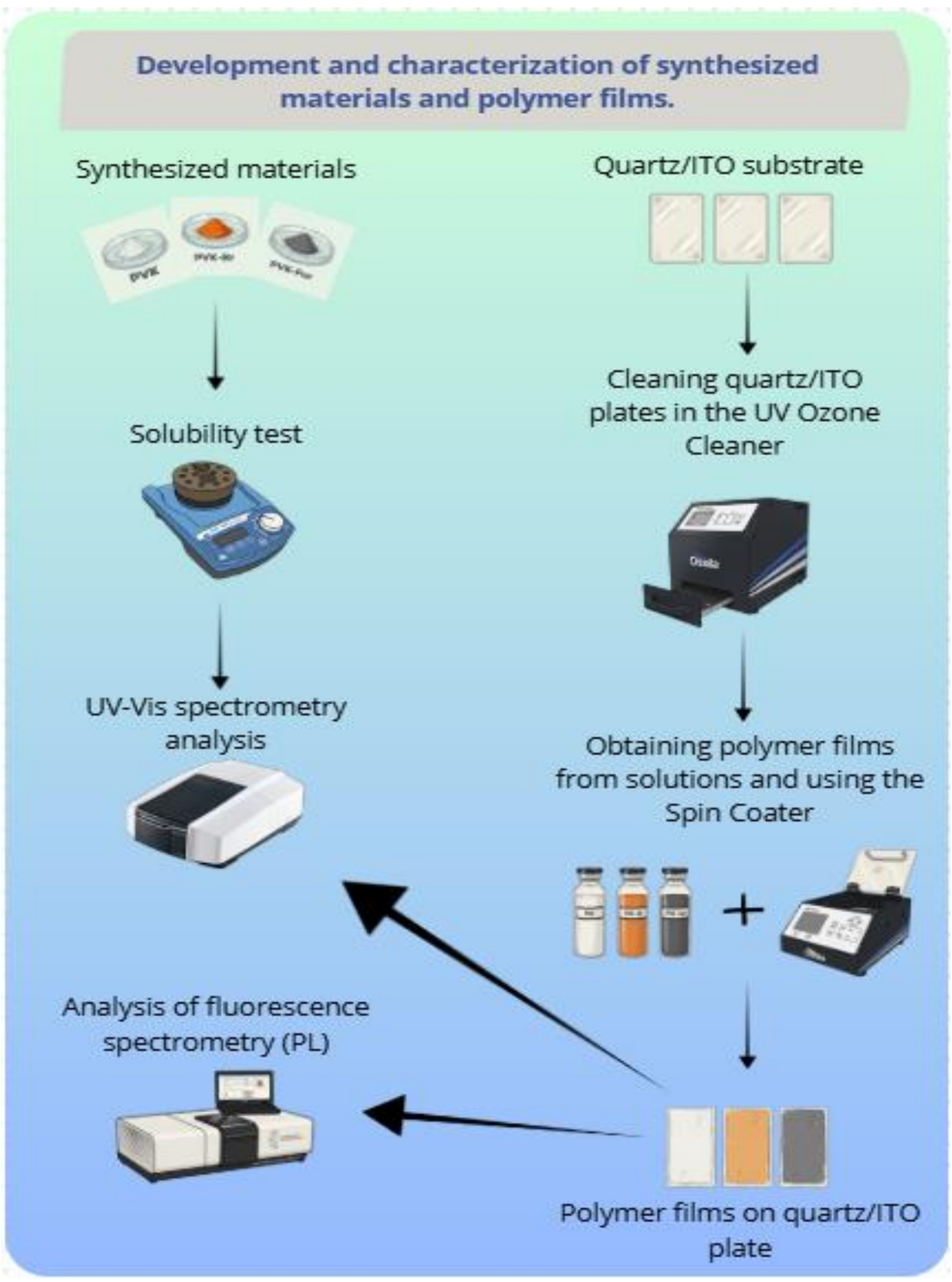


Figure 2 - Synthesis of PVK-Fur from PVK-Br using the C-C cross-coupling reaction via the Suzuki-Miyaura reaction.



RESULTS & DISCUSSION

- **UV-Vis spectrometry analysis**

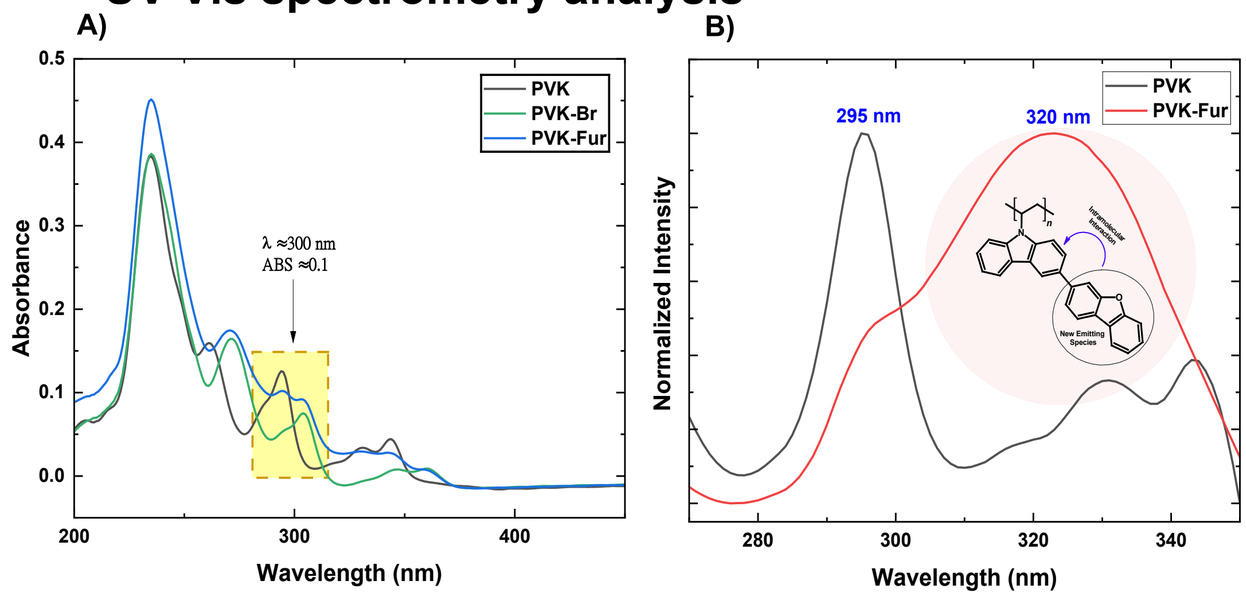


Figure 3 A) – Spectra of the photophysical behavior of polymers in THF solution, under diluted conditions (absorbance ≤ 0.1), to emphasize the investigation of aggregation formation and minimize the effects of the internal filter.

Figure 3B – Fluorescence spectra where PVK-Fur exhibits an intense peak at 320 nm, with modification of the spectrum indicating the presence of different species in an excited state or associated intermolecular interactions.

- **Photoluminescence spectrometry**

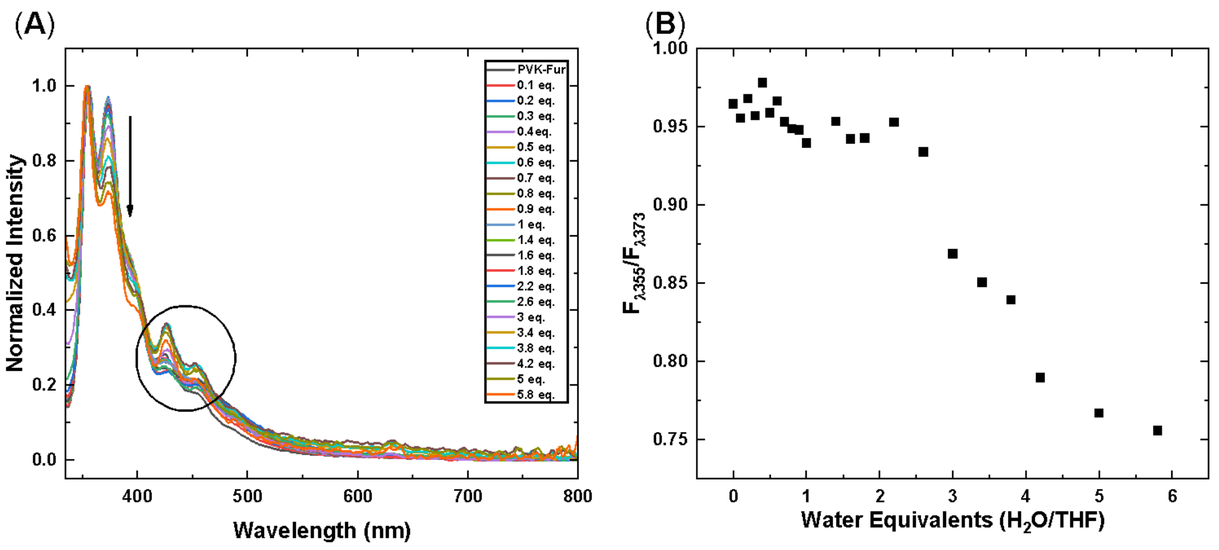


Figure 4A– PL spectra from the initial addition of 0.1 eq of water inducing an increase in emission intensity, increasing the PLQY from 12.2% (pure PVK-Fur) to 14%.

Figure 4B – Fluorescence intensity of the 355 nm and 373 nm peaks during water titration, plotted against water equivalents, highlighting the two processes: initial AIE and subsequent ACQ.

CONCLUSION

The emission performance of PVK-Fur is highly dependent on its physical state. These findings suggest that PVK-Fur is either particularly suitable for use as a host matrix or emissive component in hybrid OLED architectures, fluorescence sensors, and photonic garments.

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CAPES

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