PÔSTER - RESUMO - DISPOSITIVOS OPTOELETRÔNICOS

EFFECT OF ULTRA-HIGH MOLAR MASS PVK ASSISTANCE ON IMPROVING THE PERFORMANCE OF SOLUTION-PROCESSED GREEN TADF OLEDS

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Poly(9-vinylcarbazole) (PVK) is a high molar mass homopolymer widely used in light-emitting devices due to its easy solution processability and charge transport properties [1,2]. Therefore, many studies have been conducted on its use in host-guest systems, as it reveals a high level of triplet suitable for green hosts (dopants) [3]. In this work, we investigated the effect of two new very high molar mass PVKs, named PVK3 (Mw ~3,000,000 g/mol) and PVK37 (Mw ~37,000,000 g/mol) [4], as hosts of the green TADF emitter (2PXZ-OXD) [5,6] in electroluminescent devices, and their properties are compared with those of commercial PVK (PVKc). Given that PVK is a good hole transporter, a co-host is usually added in host-guest systems to assist in hole injection, improving the characteristics of the devices [7]. Among the most commonly used materials is 1,3-di-9-carbazolylvenzene (mCP) [8].Thus, the constructed devices had the following configuration: ITO | PEDOT:PSS | PVK:mCP:2PXZ-OXD | TmPyPB | Ca|Al, and their electroluminescent properties were obtained. The JxVxL curves

obtained revealed that PVK3, with an intermediate molar mass among the evaluated PVKs, presented higher brightness values (3999 cd/m²) and a drive voltage of 4.5V. The film produced for this polymer was homogeneous and also exhibited lower roughness (Ra: 0.15 nm and RMS: 0.25 nm) compared to the other PVKs. Therefore, PVK3 proves to be a good host for light-emitting devices as it provides better charge transport properties.

1. Wang, D. et al. Highly efficient blue quantum-dot light-emitting diodes based on a mixed composite of a carbazole donor and a triazine acceptor as the hole transport layer. Physical Chemistry Chemical Physics 24, 16148–16155 (2022).

2. Thadathilanickal, T. D., Paul, M. & Karunakaran, V. Ultrafast Intermolecular Energy Transfer in OLED Materials: Excited-State Dynamics of a Blend of Poly(vinylcarbazole) and Oxadiazole Derivative in Solution and Film States. Journal of Physical Chemistry C 127, 10640–10648 (2023).

3. Jankus, V. et al. The role of exciplex states in phosphorescent OLEDs with poly(vinylcarbazole) (PVK) host. Org. Electron. 20, 97–102 (2015).

4. de Brito, E. B., de Morais, A., De Freitas, J. N., Valaski, R. & Marques, M. de F. V. Improved properties of high molar mass poly (9-vinylcarbazole) and performance as a light emitter compared with the commercial PVK. Materials Science & Engineering B 286, (2022).

5. Kumar, M. & Pereira, L. Mixed-Host Systems with a Simple Device Structure for Efficient Solution-Processed Organic Light-Emitting Diodes of a Red-Orange TADF Emitter. ACS Omega 5, 2196–2204 (2020).

6. Lee, J. et al. Oxadiazole- and triazole-based highly-efficient thermally activated delayed fluorescence emitters for organic light-emitting diodes. J. Mater. Chem. C Mater. 1, 4599–4604 (2013).

7. Kim, Y. et al. Monomer-mixed hole transport layers for improving hole injection of quantum dot light-emitting diodes. Opt. Express 31, 20730 (2023).

8. Teixeira, F., Germino, J. C. & Pereira, L. Wet-Deposited TADF-Based OLED Active Layers: New Approaches towards Further Optimization. Applied Sciences (Switzerland) 13, (2023).

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Palavras-chave: thermally activated delayed fluorescence; host-guest system; oled; pvk.