cbecimat26
26° Congresso Brasileiro de Engenharia e Ciência dos Materiais
22 a 26 de novembro de 2026
Costão do Santinho
Florianópolis-SC

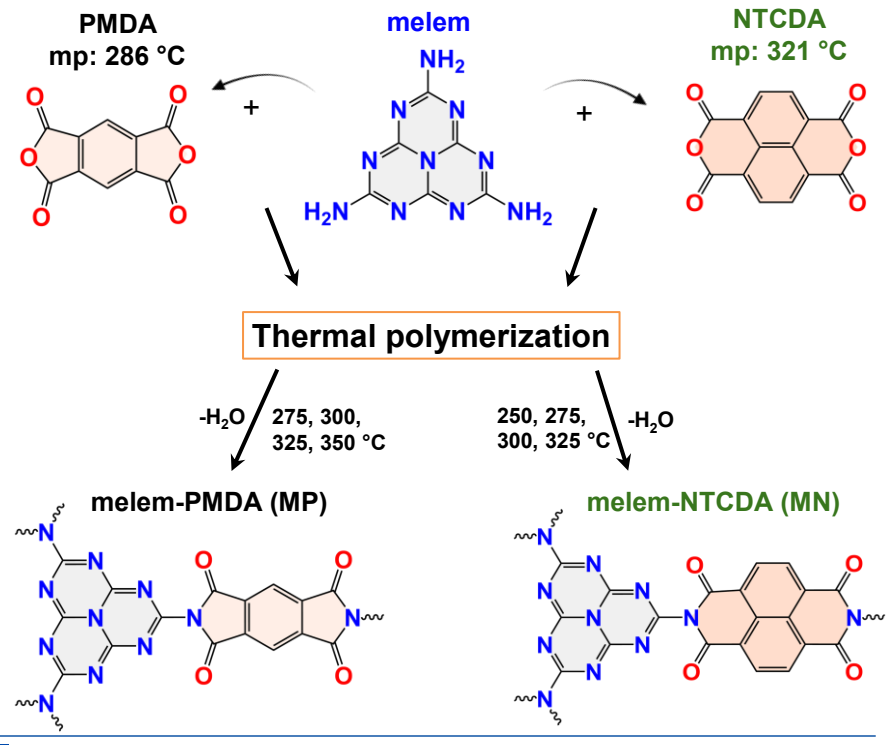
Engineering structure-performance relationship in tri-s-triazine-based polyimides photocatalysts

Renan F. Bez[1], **Luisa I. Fusinato**[1,2], Vinicius Glitz[1], Felipe L. Marino[1], Camila P. Magrin[1], Ricardo A. F. Machado[1], Gustavo A. Micke[1], Renato L. T. Parreira[1], Giovanni F. Caramori[1], François Perreault[2], Adriana P. Gerola[1]*.
[1]Federal University of Santa Catarina, 88040-900, Florianópolis, Santa Catarina, Brazil.
[2]Université du Québec à Montréal, H2L 2C4, Montréal, Québec, Canada.
* adriana.gerola@ufsc.br

Introduction

- **Heterogeneous photocatalysis** enables solar-driven pollutant degradation, but conventional metal-based semiconductors exhibit limited visible-light absorption, motivating the development of sustainable photocatalysts such as organic materials.
- **Tri-s-triazine-based polyimides (TPIs)** combine visible-light absorption, donor–acceptor charge separation, and facile thermal synthesis, making them promising organic photocatalysts for environmental remediation.
- This study explores the influence of **synthesis temperature** and **anhydride nature** on the structure, **charge-transfer behavior**, and photocatalytic performance of TPIs.

Methodology



Results

Figure 1 – XPS high resolution O1s spectra of MP (a) and MN (b).

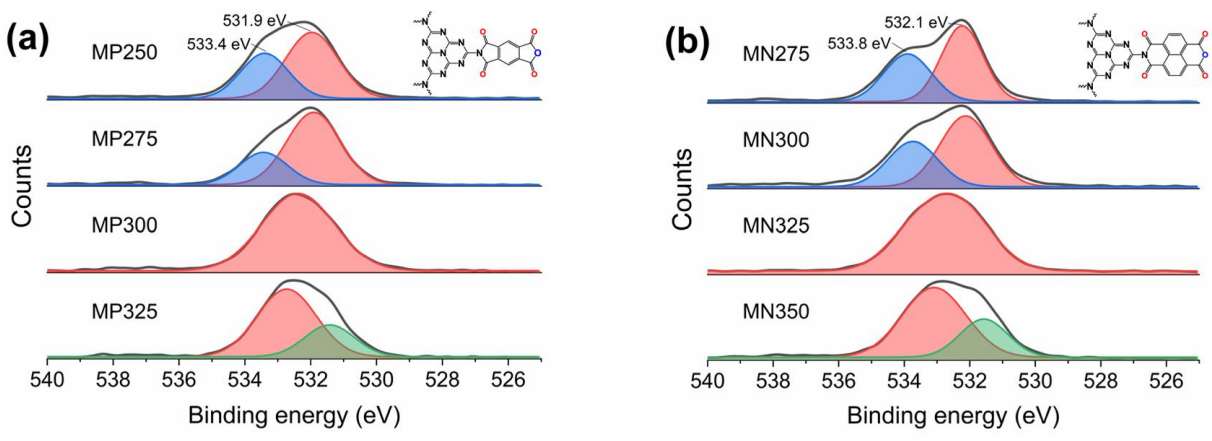


Figure 2 – Calculated rate constants for methyl orange photodegradation.

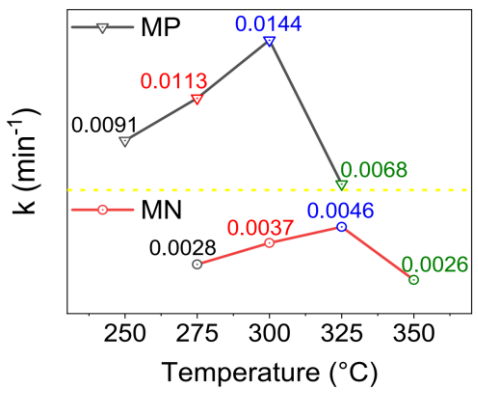


Figure 3 – Transient photocurrent response of MP (a) and MN (b).

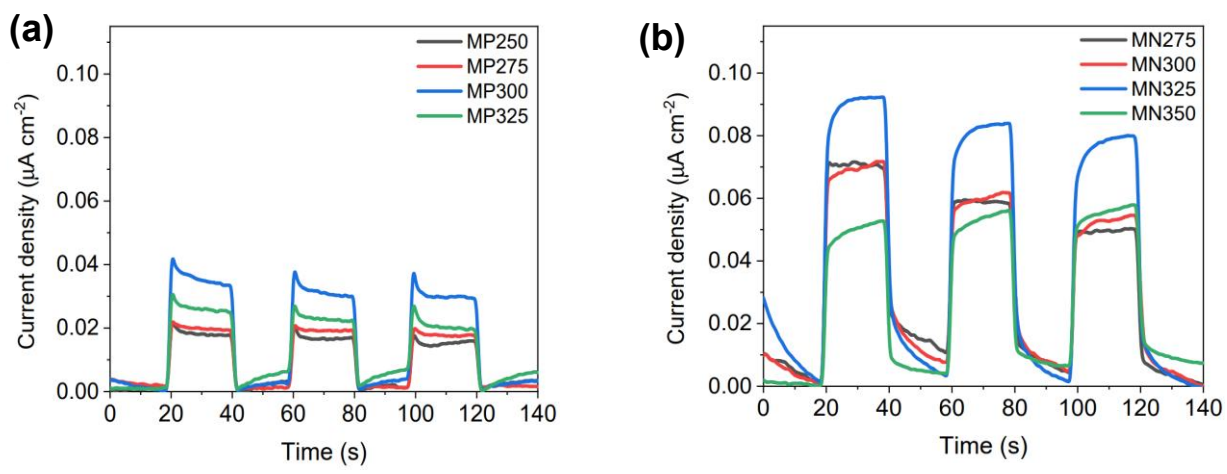


Figure 4 – Solid-state EPR spectra.

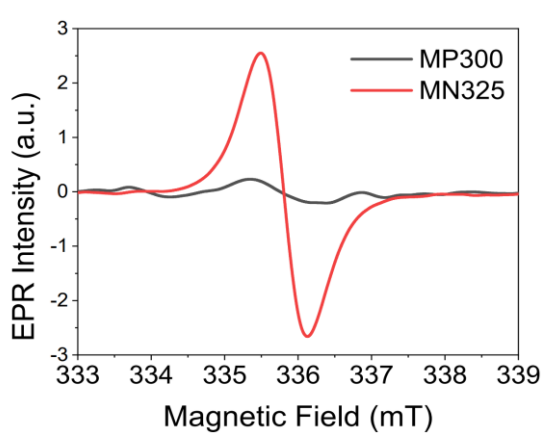


Figure 5 – Charge density surfaces for MP:1 (a) and MN:1 (b), highlighting the spatial redistribution of electron density. Red (positive contour level) and blue (negative contour level) surfaces representing charge depletion and accumulation regions, respectively.

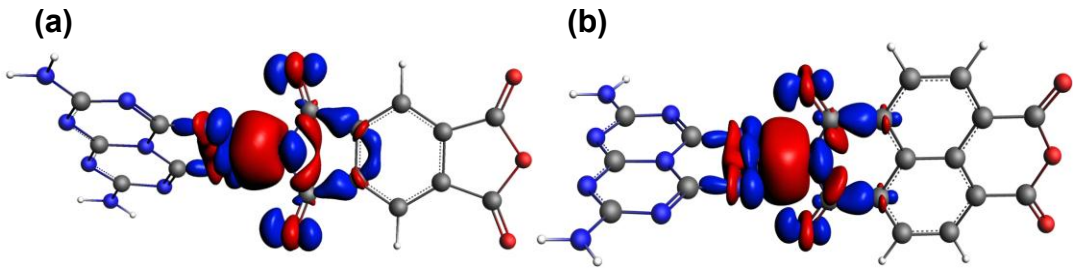
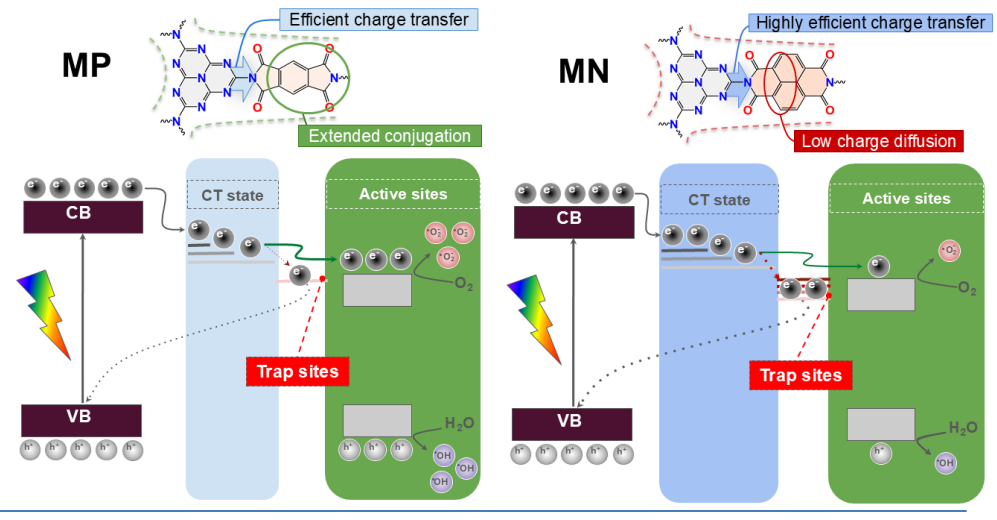


Figure 6 – Schematic illustration of the charge dynamics with trap sites.



Conclusion

- Imidization temperature and anhydride nature synergistically influenced the structure, electronic properties, and charge dynamics of tri-s-triazine-based polyimides.
- Understanding these relationships enables the targeted design of organic semiconductor photocatalysts with improved charge transport and visible-light activity.

References

S. Chu, J. Shao, H. Qu, X. Wang, R. Xiao and H. Zhang, *Chem Sus Chem*, 2023, 16, e202300886; X. Wang, S. Chu, J. Shao, C. Liu, Z. Luo, R. Xiao and H. Zhang, *ACS Sustainable Chem.* Eng., 2022, 10, 11555–11566; C. Ru, X. Nie, Z.-A. Lan, Z. Pan, W. Xing, S. Wang, J. C. Yu, Y. Hou and X. Wang, *Angew. Chem.*, Int. Ed., 2025, 137, e202417712.

Aknowledgements

NSERC CRSNG · CAPES · CQMF · fapesc Fundação de Amparo à Pesquisa e Inovação do Estado de Santa Catarina · NanoQAM · CNPq Conselho Nacional de Desenvolvimento Científico e Tecnológico · HyPT Hydrogen Production Technologies A Global Center · INCT catálise