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White Light Emission-Based [c2]Daisy Chains and [1]Rotaxanes of Mechanically Interlocked Molecules for Various Sensor Applications

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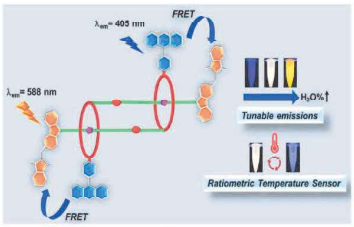
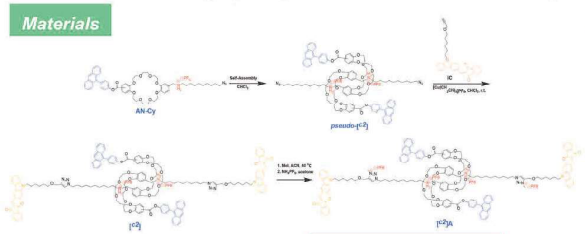
ABSTRACT

White-light-emitting materials are essential for sensing and imaging. This dissertation introduces novel mechanically interlocked molecules (MIMs) with tunable, including white-light, emissions. Bistable [c2] daisy chain rotaxanes with aggregation-induced emission (AIE) and Förster resonance energy transfer (FRET) display tunable emissions and serve as temperature sensors. A unique [1]rotaxane with nano-bending exhibits white light and color tunability, controlled by acid/base interactions. These MIMs showcase the potential for innovative luminescent materials and sensor applications.

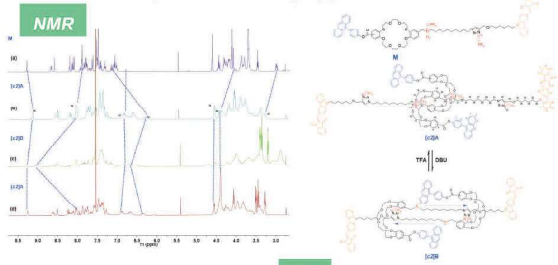
Controllable AIE and FRET Behaviors of Bistable [*c2*] Daisy Chain Rotaxanes for White-Light Emission and Temperature-Sensing Applications



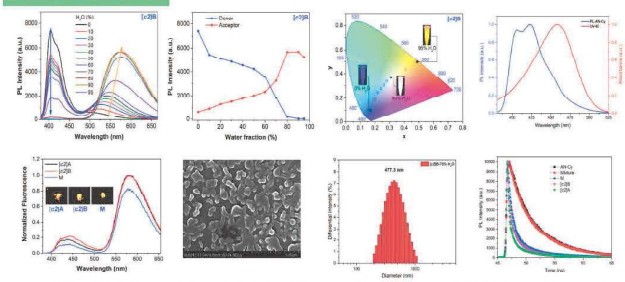
Materials



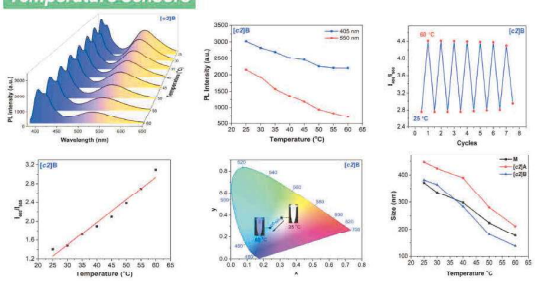
NMR



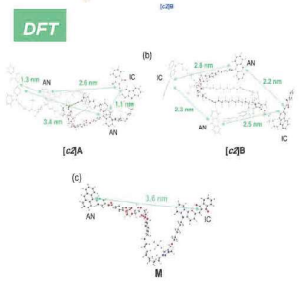
Characterizations



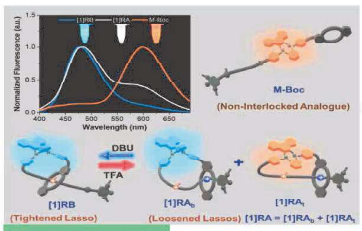
Temperature sensors



DFT



Tunable Nano-Bending Structures of Loosened/Tightened Lassos with Bi-Stable VIE for Multi-Manipulations of White-Light Emissions and Sensor Applications



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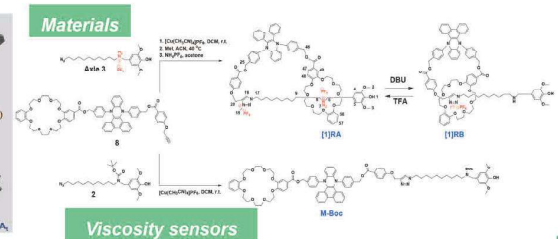

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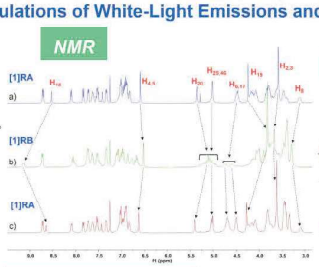

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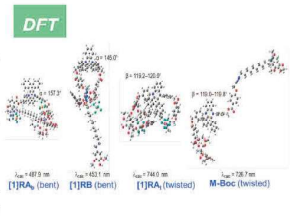
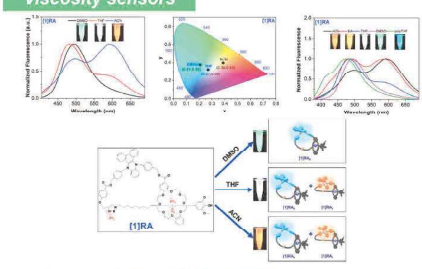
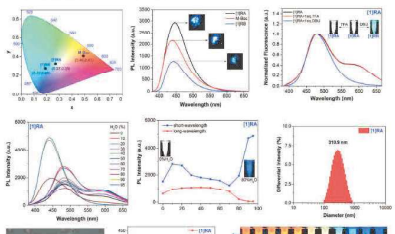


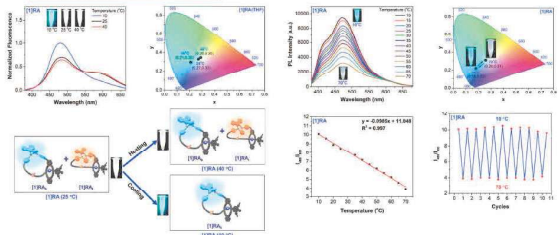
Viscosity sensors



Characterizations



Temperature sensors



SUMMARY

In summary, this research successfully demonstrates the design and functionality of novel MIMs with tunable, white-light emissions. By leveraging AIE, FRET, VIE, and molecular nano-bending, these MIMs show promise for responsive luminescent applications in temperature and viscosity sensing. The findings highlight the potential of MIMs to advance the field of smart materials, offering new avenues for applications in imaging, sensing, and environmental monitoring.

References

1. **Trung, N. T.**; Chiu, C. -H.; Cuc, T. T. K.; Khang, T. M.; Jalife, S.; Nhien, P. Q.; Hue, B. T. B.; Wu, J. I.; Li, -Y.; Lin, H. -C. Tunable Nano-Bending Structures of Loosened/Tightened Lassos with Bi-Stable Vibration-Induced Emissions for Multi-Manipulations of White-Light Emissions and Sensor Applications. *Adv. Mater.* **2024**, 2311789.
2. **Trung, N. T.**; Nhien, P. Q.; Kim Cuc, T. T.; Wu, C.-H.; Bui Hue, B. T.; Wu, J. I.; Li, Y.-K.; Lin, H.-C. Controllable Aggregation-Induced Emission and Förster Resonance Energy Transfer Behaviors of Bistable [c 2] Daisy Chain Rotaxanes for White-Light Emission and Temperature-Sensing Applications. *ACS Appl. Mater. Interfaces* **2023**, *15* [12], 15353−15366.