# Efficient Red Emission AEE-active Polyelectrolyte Constructed From Pyridinium-Modified Tetraphenylethene

**Chen Rui (21529051),[a] Jing Zhi Sun,*[a] Ben Zhong Tang*[ab]**

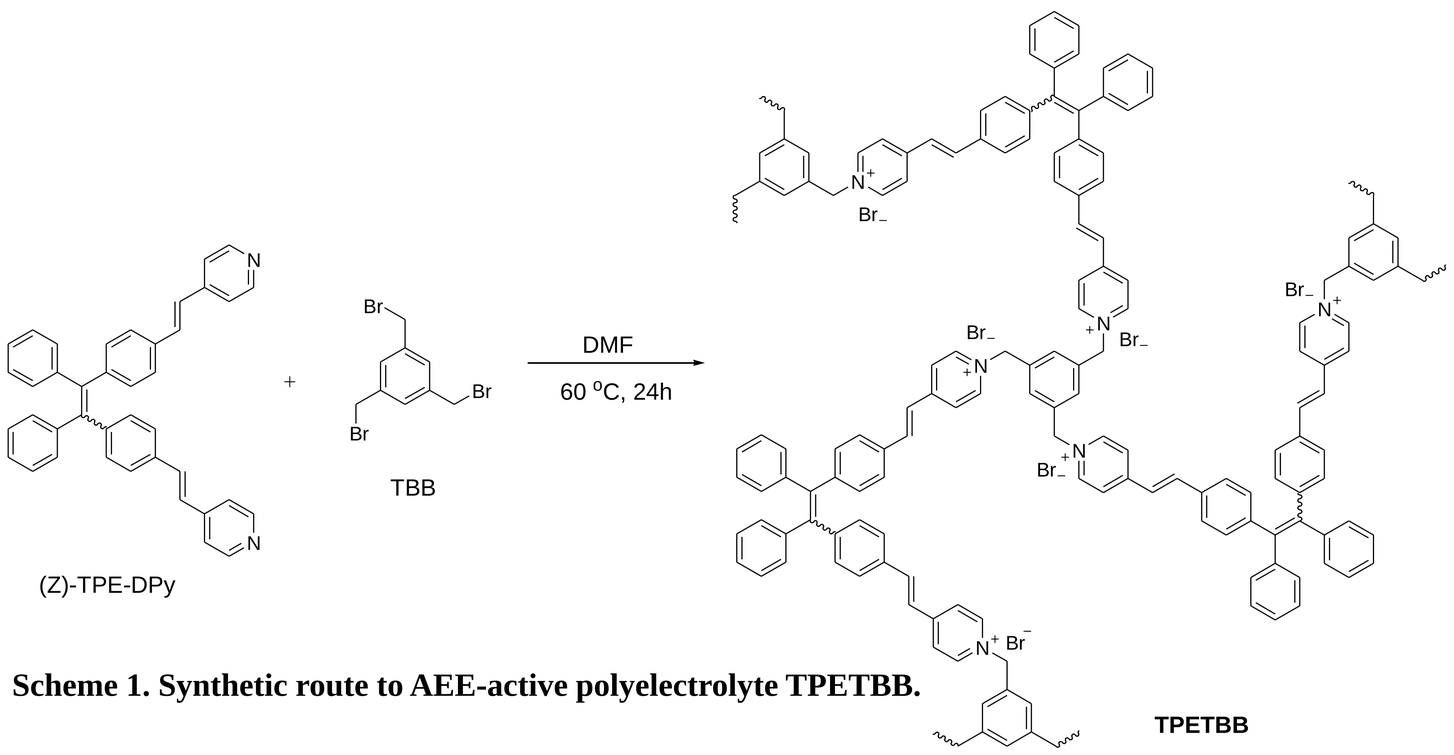
*[a] MOE Key Laboratory of Macromolecular Synthesis and Functionalization, Department of Polymer Science and Engineering, Zhejiang University, Hangzhou, China.*
*[b]Department of Chemistry, Institute for Advanced Study, Institute of Molecular Functional Materials, and State Key Laboratory of Molecular Neuroscience, The Hong Kong University of Science & Technology, Clear Water Bay, Kowloon, Hong Kong, China.*

## INTRODUCTION

Fluorescent polymers are promising materials for various applications, for instance, chemo/biosensors, bio-imaging and light-emitting diodes. Unfortunately, the fluorescence quantum yields of conventional fluorescent polymers decrease dramatically in their condensed phase or aggregates. The AIE (aggregation-induced emission) active molecules show opposite behaviors. They are non-emissive or emit faintly in solutions, while highly emissive in aggregates or solid states, which blaze a wide road for various practical applications. By introducing AIE-active units into polymers, the derived polymeric materials can often be bestowed with aggregation enhanced emission (AEE) property. But AEE-active and polyelectrolyte polymers have never been reported. Here we present an efficient red emission and AEE-active polyelectrolyte constructed from pyridinium-modified tetraphenylethene, a typical AIE-gen.[1]

## RESULTS AND DISCUSSION

### 1. Molecular structures of the AEE-active polyelectrolyte containing pyridinium-modified tetraphenylethene moieties




**Scheme 1. Synthetic route to AEE-active polyelectrolyte TPETBB.**

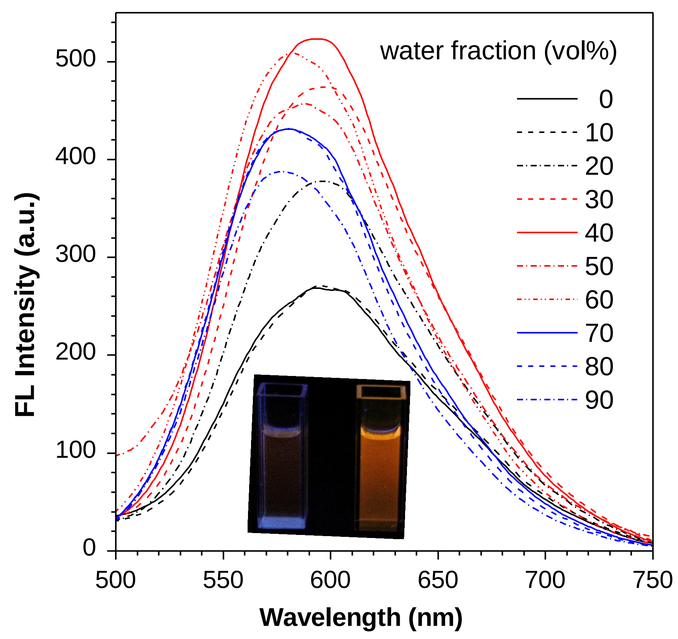



**Fig. 2.** Fluorescence (FL) spectra of TPETBB in DMSO/water mixtures with different water fractions ($f_w$). Inserts: photographs of TPETBB in DMSO/water mixtures with $f_w$ = 0 (left) and $f_w$ = 40% (right) under 365 nm UV light.

### 2. Red-emission in solution, large Stokes shift, and AEE behavior

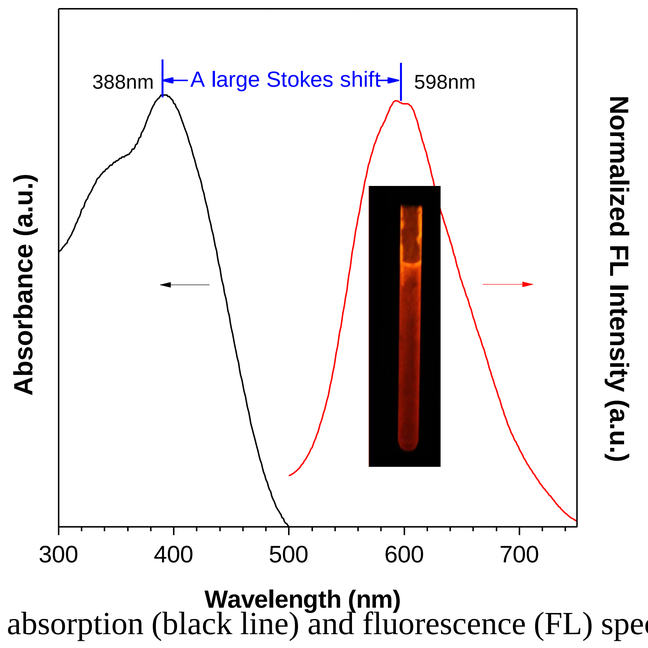



**Fig. 1.** UV-vis absorption (black line) and fluorescence (FL) spectra (red line) of TPETBB in DMSO. Concentration of TPE unit = 10 μM. Inset: photograph of the emission from TPETBB in DMSO under 365 nm UV light.

### 3. Efficient emission in solids and robustness to external stimulus (such as pH, solvent polarity, mechanical force)

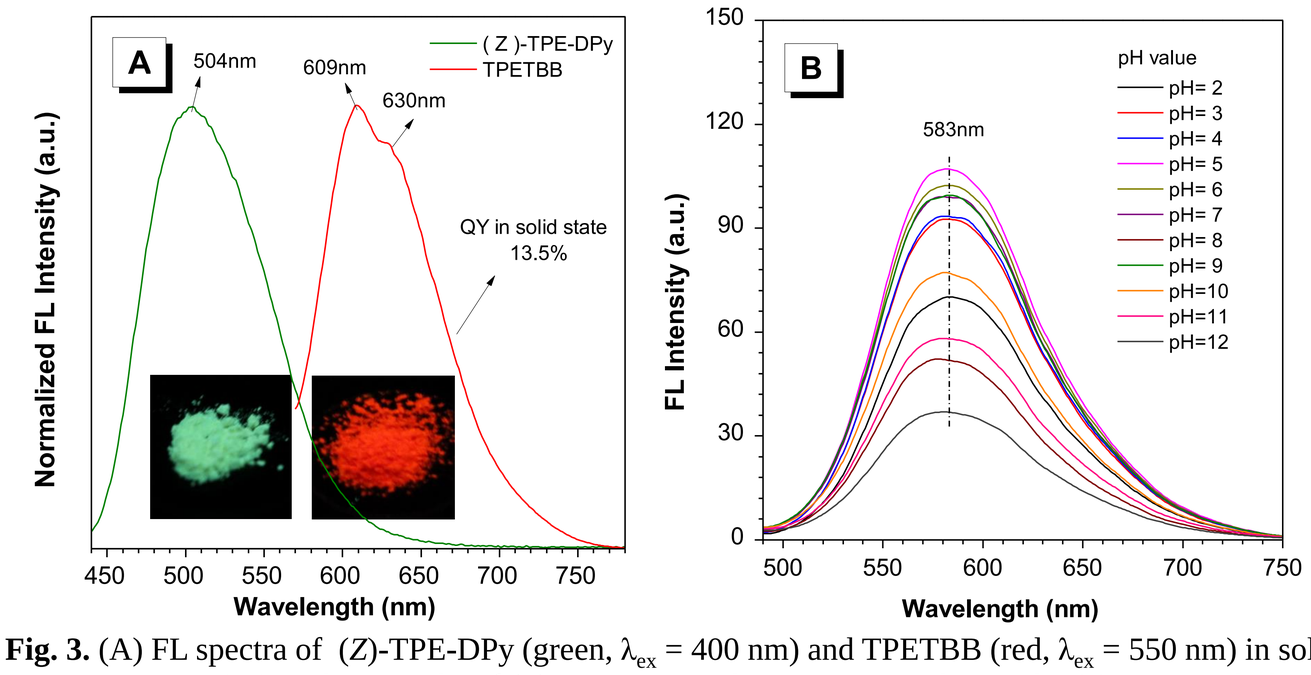



**Fig. 3.** (A) FL spectra of (*Z*)-TPE-DPy (green, $\lambda_{ex}$ = 400 nm) and TPETBB (red, $\lambda_{ex}$ = 550 nm) in solid state. Inserts: emission photographs of (*Z*)-TPE-DPy and TPETBB powders under 365 nm UV light. (B) FL spectra of TPETBB in Britton-Robinson Buffer Solutions (with 10% DMSO) of different pH values: from 2.0 to 12.0.

## SUMMARY

We have successfully synthesized an AEE-active polyelectrolyte constructed from Pyridinium-Modified Tetraphenylethene. Its efficient red emission and good solubility in DMSO/water system make it promising in bio-imaging and bio-sensing.

## ACKNOWLEDGMENTS

This work was financially supported by “973” project No. 2013CB834704.

## References

[1] T. Hu, J. Z. Sun, and B. Z. Tang, *et al. Chem. Commun.*, 2015, **51**, 8849.