



# Click Synthesis, AIE, *E/Z* Isomerization, Self-Organization, and Multiple Chromisms of Pure Stereoisomers of a TPE-Cored Luminogen

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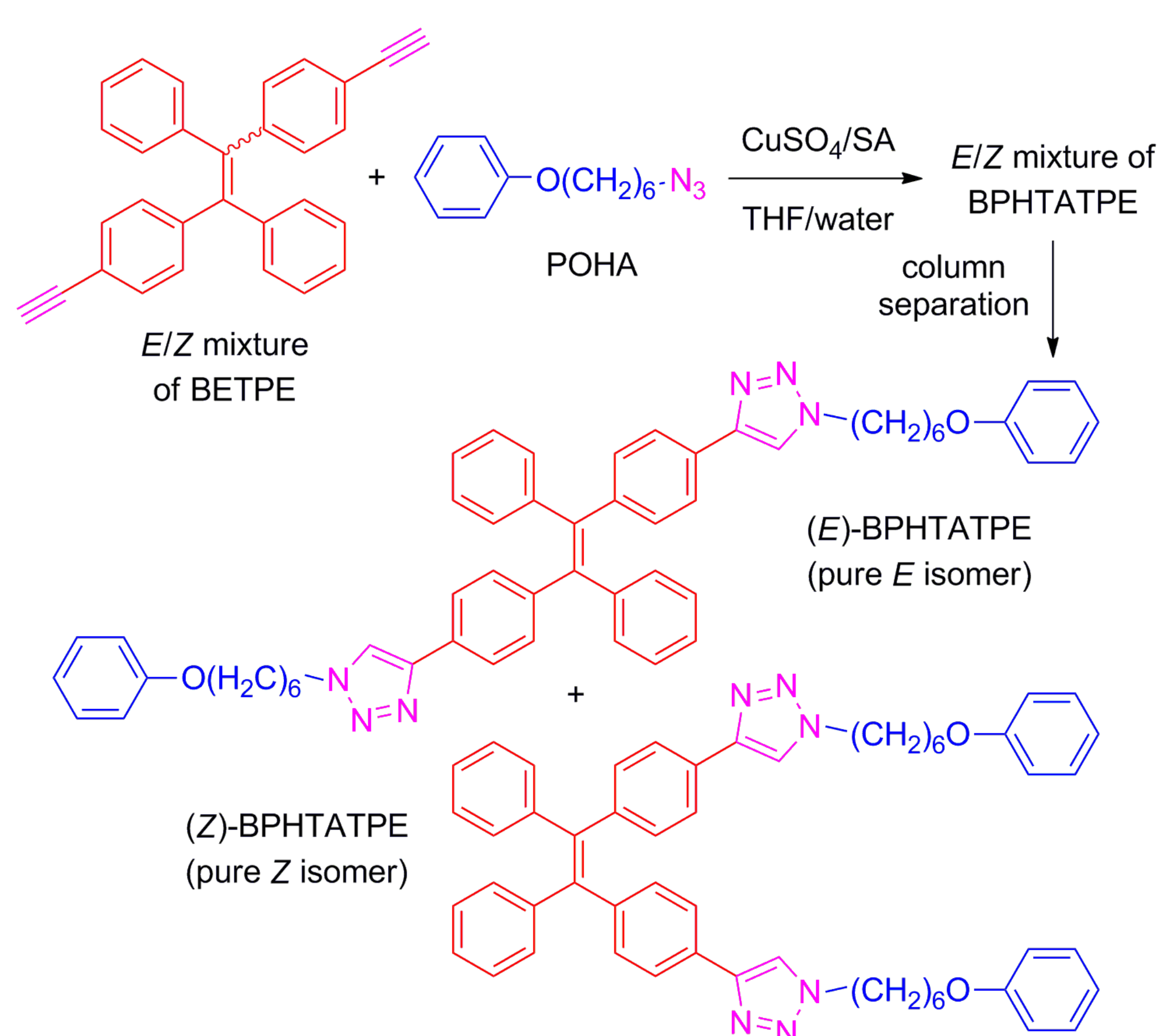
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## INTRODUCTION

Aggregation-induced emission (AIE) is an unusual photophysical phenomenon discovered by Tang *et al.* in 2001, which is exactly opposite to the aggregation-caused quenching (ACQ) effect of conventional luminophores.<sup>1</sup> In the large class of AIE luminogens developed so far, tetraphenylethene (TPE) is unique in that it is synthetically readily accessible and structurally easily manipulable. Its exact AIE mechanism, however, remains to be deciphered. The issue involved is whether its AIE process is associated with the *E/Z* isomerization (EZI) or the restriction of intramolecular rotation (RIR).<sup>2</sup> In this work, we put an end to this controversy.

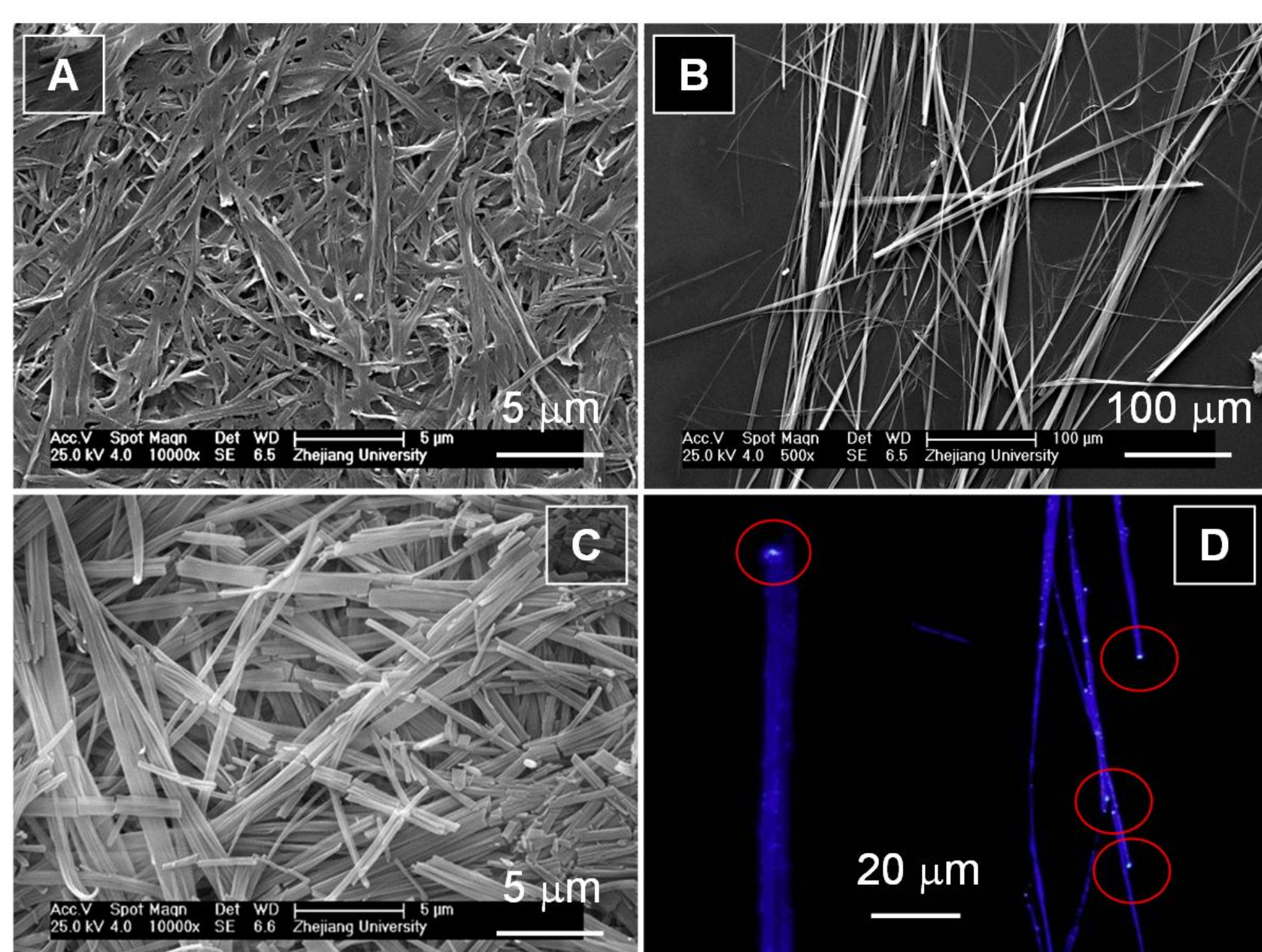
## RESULTS AND DISCUSSION

### Molecular Design



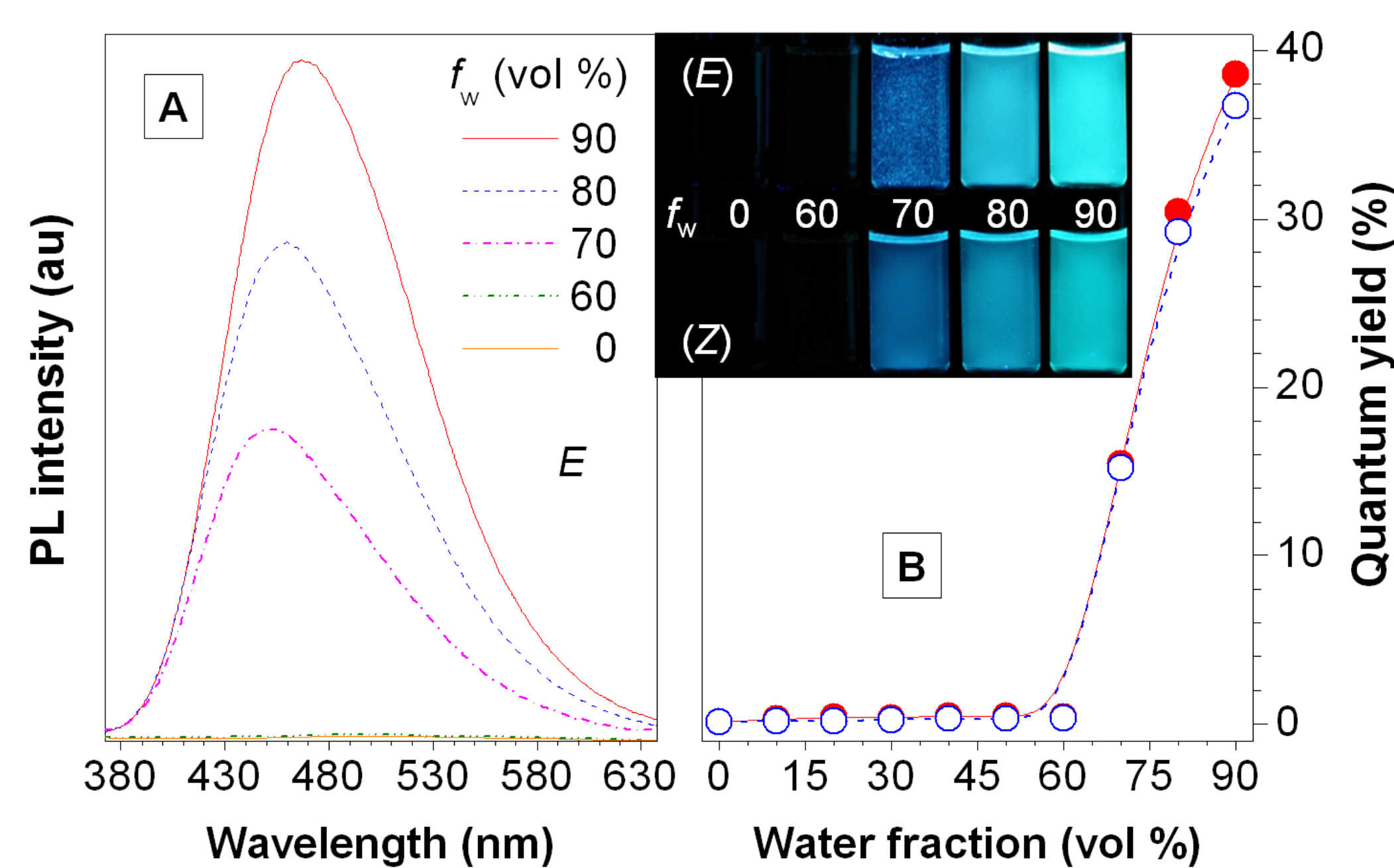
**Scheme 1.** Synthesis of *E*- and *Z*-BPHTATPE by Click Reaction.

### Self-Organization



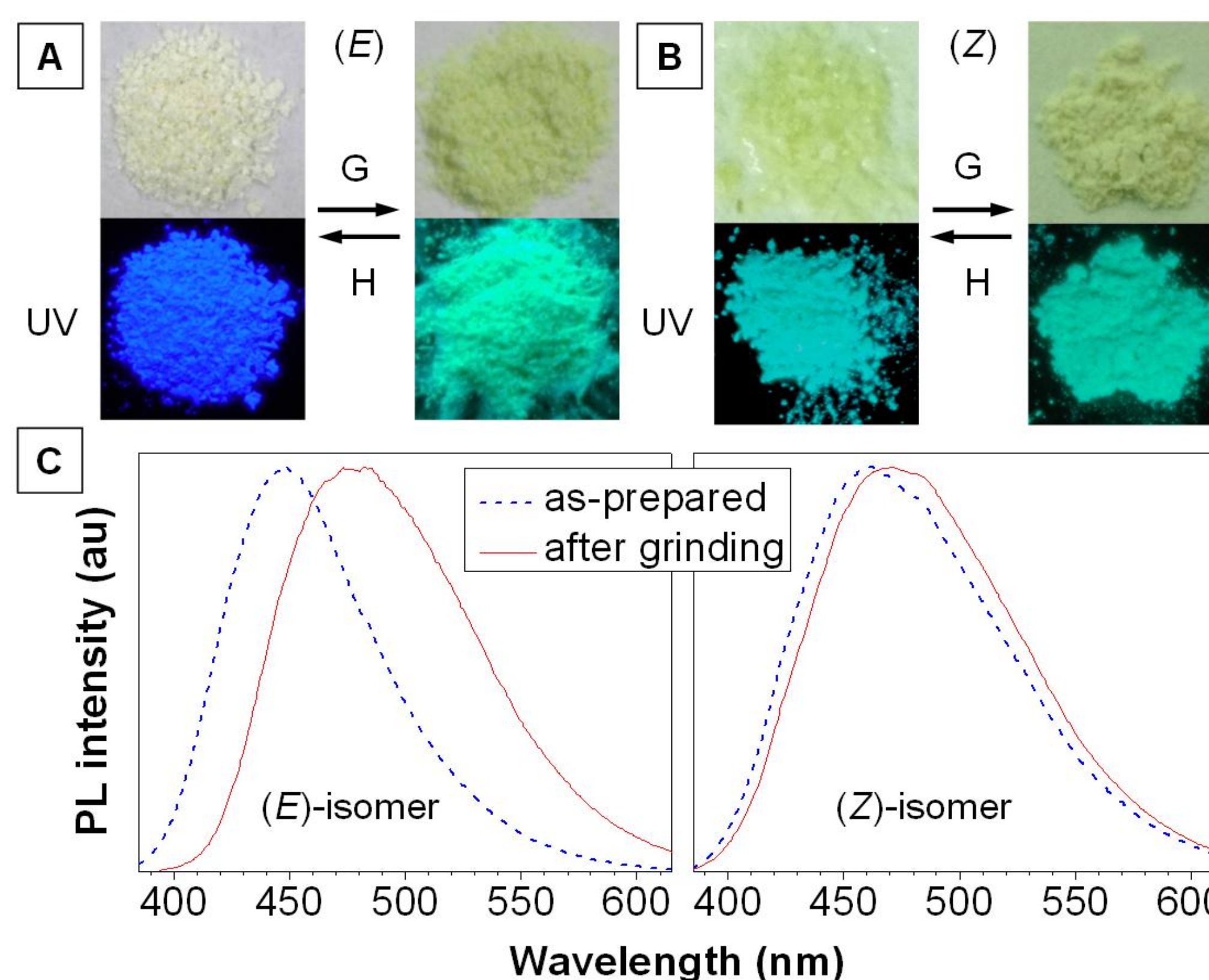
**Figure 3.** (A, B, C) SEM microphotographs of the self-organized structures of (*E*)-BPHTATPE and (D) Fluorescent image of the microfibers.

### Aggregation-Induced Emission



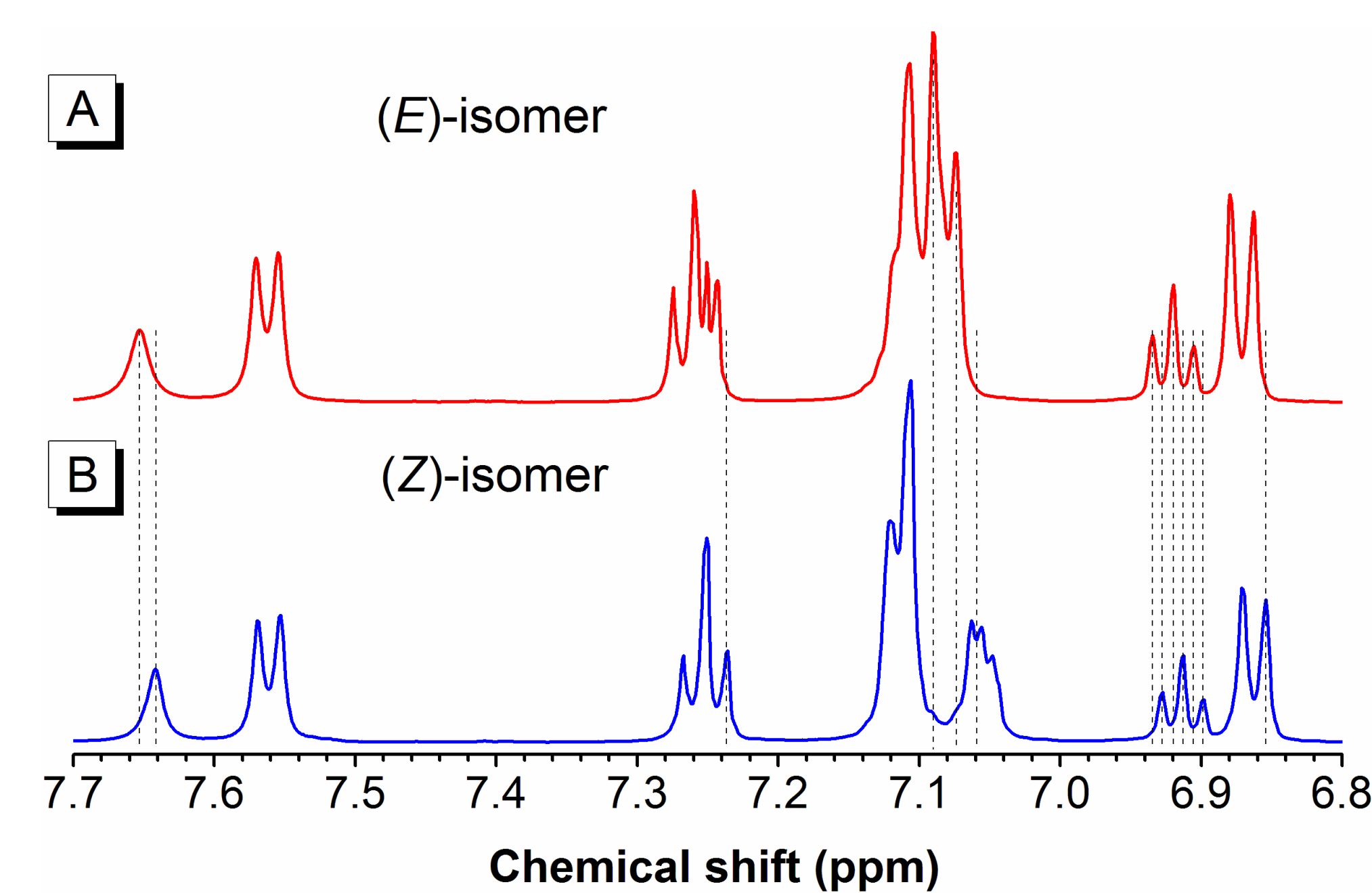
**Figure 1.** (A) PL spectra of (*E*)-BPHTATPE in THF/water mixtures; (B) Variations in their quantum yields with water fractions ( $f_w$ ).

### Mechanochromism



**Figure 4.** (A, B) Photographs of prepared (left) and ground (right) samples of the (*E*)- and (*Z*)-BPHTATPE; (C) the corresponding PL spectra.

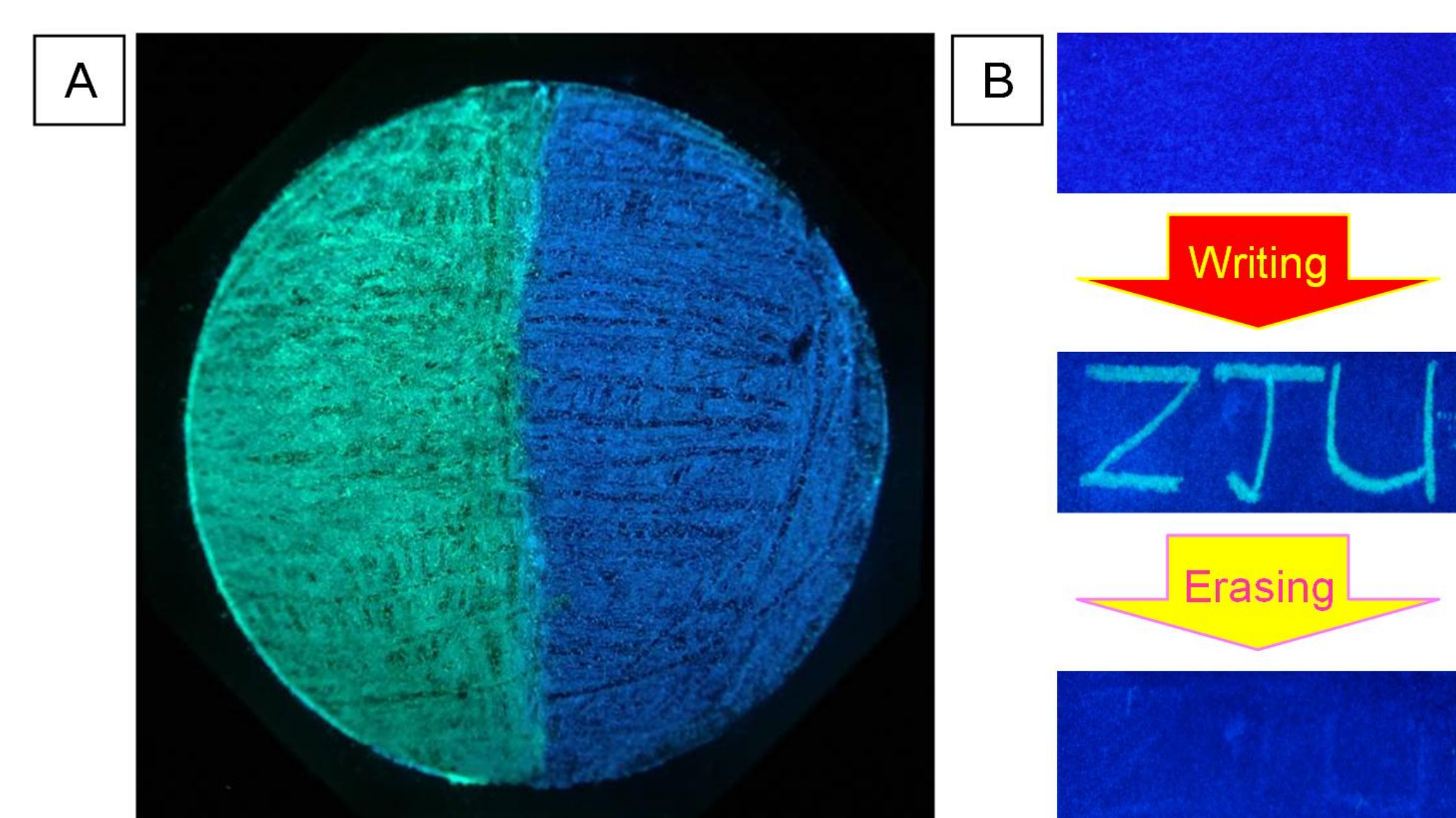
### Mechanism Study



**Figure 2.** <sup>1</sup>H NMR spectra of (A) (*E*)-BPHTATPE, and (B) (*Z*)-BPHTATPE.

**No isomerization could be detected under normal conditions, thus the mechanism of AIE must be RIR.**

### High-Tech Applications



**Figure 5.** Fluorescence images of (A) a sphere of ground (*E*)-BPHTATPE with its right side fumed with CHCl<sub>3</sub> vapor for 1 min, (B) process of writing and erasing letters on a filter paper.

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## CONCLUSIONS

With an innovative structure design, the pure *E*- and *Z*- isomers of a TPE derivative were obtained successfully. Using these precious pure isomers, the AIE mechanism of TPE based luminogens was studied and finally confirmed to be the **RIR**. The novel properties of the isomers, such as mechanochromism, make them good candidates in high-tech applications. For more details please see: *J. Am. Chem. Soc.* **2012**, *134*, 9956.

## ACKNOWLEDGMENTS

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## REFERENCES

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