



# N-type pyrazine-based luminogens with aggregation-induced emission characteristics

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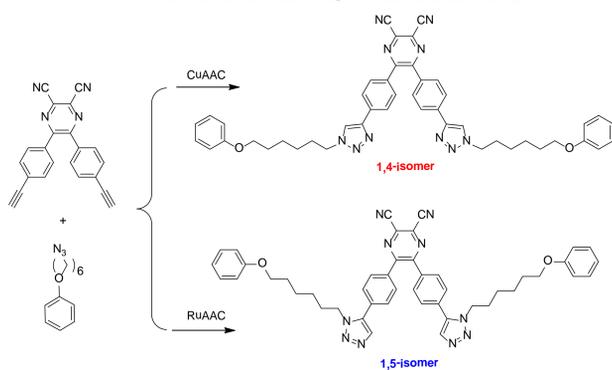
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## INTRODUCTION

Among luminogens with aggregation-induced emission (AIE) characteristics, N-type molecules are rare in comparison with P-type and neutral species in despite of their indispensable roles in functions as electron transport and electron acceptor materials.<sup>1</sup> During our exploration for new AIE-active luminogens, we found that a pyrazine derivative features such property.<sup>2</sup> Furthermore, thanks to its electron-deficient property, this molecule could also serve as N-type material. In this work, N-type pyrazine-based triazoles with 1,4- and 1,5-regioregular isomers were prepared via Cu- and Ru-catalyzed azide-alkyne click reaction. These luminogens are AIE-active and could form charge-transfer complexes with triphenylamine (TPA).<sup>3</sup>

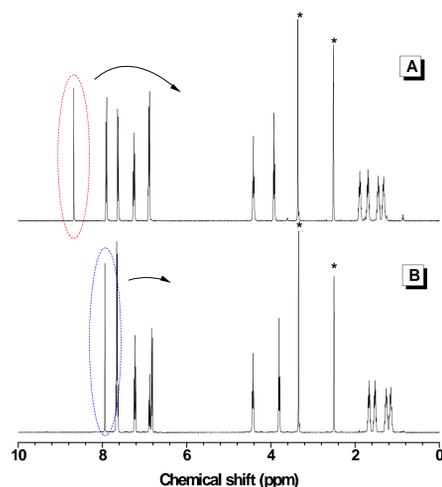
## RESULTS AND DISCUSSION

### Molecular Structures



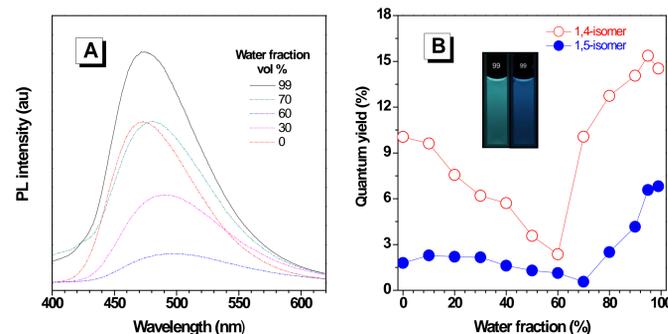
**Scheme 1.** Synthetic routes to pyrazine-based 1,4- and 1,5-triazoles by click reaction.

### Structure Characterization



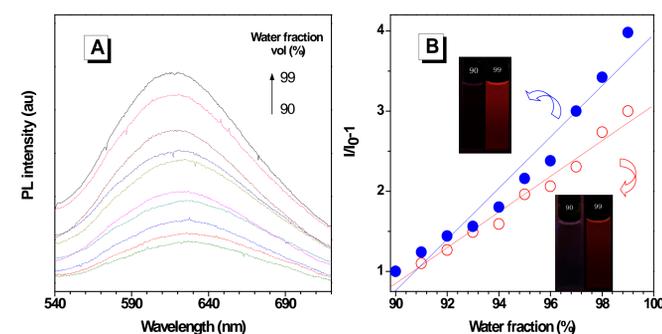
**Figure 1.** <sup>1</sup>H NMR spectra of 1,4-isomer (A) and 1,5-isomer (B) in DMSO-*d*<sub>6</sub>.

### Photo-physical Property



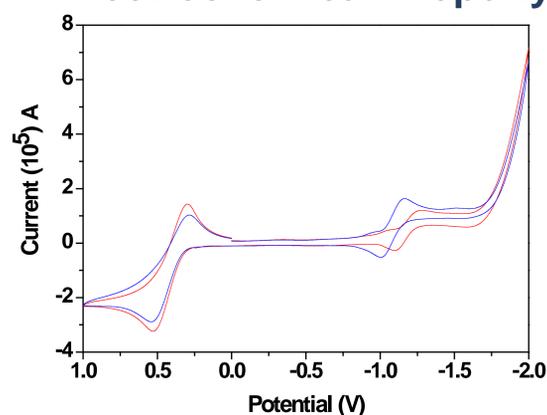
**Figure 2.** (A) PL spectra of 1,4-isomer in THF/water mixtures; (B) Variations in their quantum yields with water fractions ( $f_w$ ), Inset: 1,4-isomer (left) and 1,5-isomer (right).

### Charge Transfer Complexes



**Figure 4.** (A) PL spectra of 1,4-isomer/TPA complex in THF and its aqueous mixtures. (B) Changes of PL intensity of 1,4-isomer/TPA (red) and 1,5-isomer/TPA (blue) complexes with various fractions of water content (C) Photographs of 1,4-isomer, 1,5-isomer and their complexes with TPA in solids. All isomer/TPA complexes here prepared with the molar ratio: 1:1

### Electrochemical Property



**Figure 3.** Cyclic voltammetry (CV) curves of 1,4- (red) and 1,5- (blue) isomers.

## CONCLUSIONS

N-type pyrazine-based 1,4- and 1,5-regioregular triazoles, synthesized via click reactions, exhibit a discriminative AIE features with pale blue and dark blue emission. These luminogens could form charge-transfer complexes with TPA and emit red light in the aggregate states. This work thus offers an attractive strategy to fine-tune the emission of AIE luminogens by chemical or physical approaches.

## ACKNOWLEDGMENTS

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## REFERENCES

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