Green, Sustainable, and Efficient Syntheses of Squaraine Dyes For Biomedical and Energy-Related Applications

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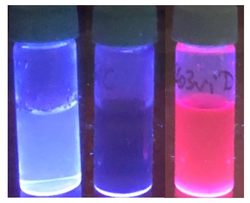
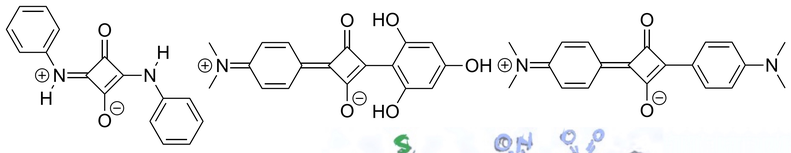


SQUARAINE DYES [1]



APPLICATIONS

(BIO)IMAGING

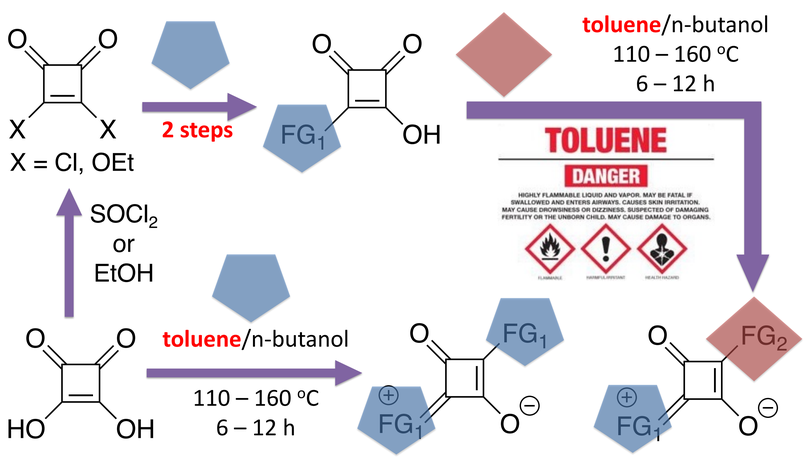
(BIO)SENSORS, LABELS & PROBES

OPTOELECTRONICS

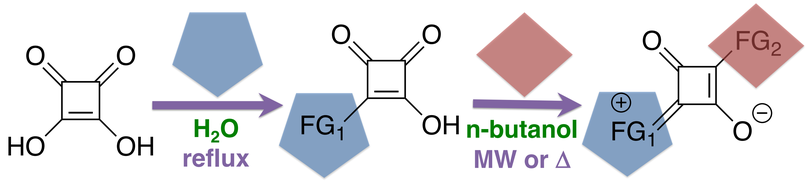
PHOTODYNAMIC & PHOTOTHERMAL THERAPIES

SYMMETRIC VS NON-SYMMETRIC SQUARAINE DYES

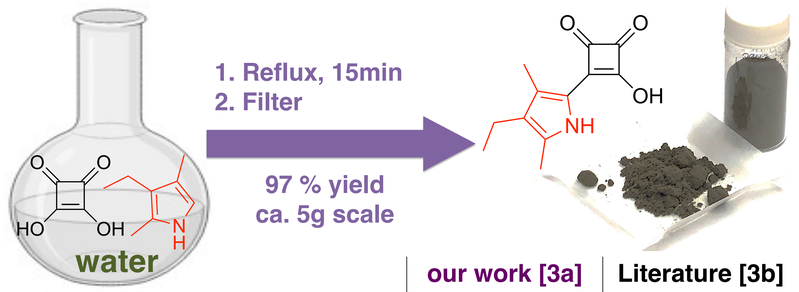
LITERATURE SYNTHESES OF SQUARAINE DYES [1,2]



GREEN, MODULAR SYNTHESIS OF NON-SYMMETRIC SQUARAINES

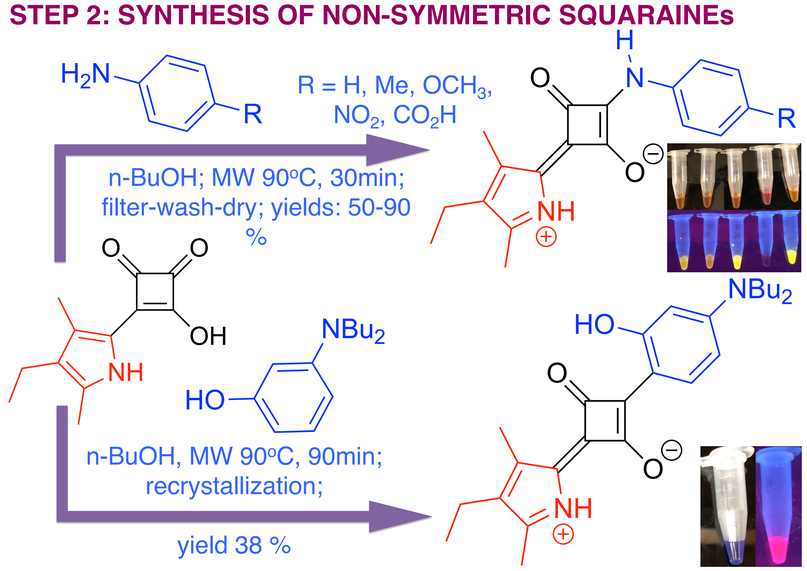


STEP 1: SYNTHESIS OF SEMI-SQUARAINE PRECURSOR

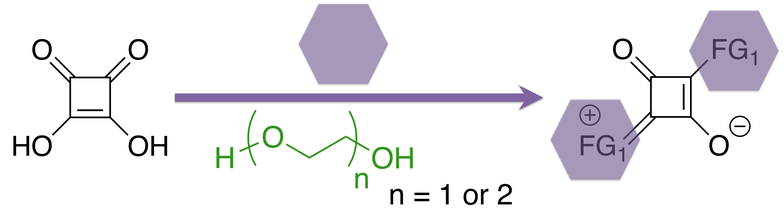


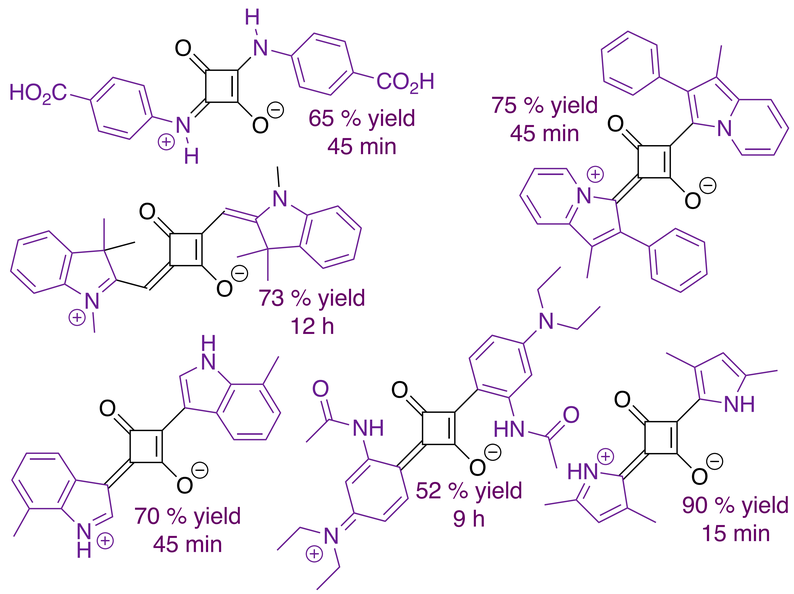
	our work [3a]	Literature [3b]
E-factor	0.2	6.2
Atom Economy	92.4	63.0
Mass Intensity	3.1	75.6
Process Mass Intensity	46.9	82.3

STEP 2: SYNTHESIS OF NON-SYMMETRIC SQUARAINEs



GREEN, CHROMATOGRAPHY-FREE SYNTHESIS OF SYMMETRIC SQUARAINES





REFERENCES

[1] a) D.D. Ta, S.V. Dzyuba, *Chemosensors*, **2021**, *9*, 302; b) S. Khopkar, G. Shankaling, *Dyes Pigments*, **2019**, *170*, 107645.

[2] a) www.osha.gov/toluene; b) Y. Chae, L. Kim, J. Lee, D. Kim, R. Cui, Y-J. An, *Environ. Pollution*, **2021**, *289*, 117836.

[3] a) D.D. Ta, J.M. Favret, S.V. Dzyuba, *Compounds*, **2023**, *3*, 17; b) D. Kiel, H. Hartmann, *Dyes Pigments*, **2001**, *49*, 161.

ACKNOWLEDGEMENTS

TCU-RCAF (#60982); TCU-SERC (#4233-224)

TCU-STAR fellowship