

Cluster Preface: Organic Photoredox Catalysis in Synthesis – Honoring Professor Shunichi Fukuzumi's 70th Birthday

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Dave Nicewicz was born and raised in the United States in Central New Jersey, before moving to North Carolina, where he completed his Bachelor's (2000) and Master's (2001) degrees in Chemistry at the University of North Carolina (USA) at Charlotte with Professor Craig A. Ogle. He then moved to the University of North Carolina at Chapel Hill (USA) where he completed his Ph.D. with Professor Jeffrey S. Johnson. Dave's studies were focused on the development of acyl anion equivalents generated via 1,2-Brook rearrangements from silyl glyoxylates, which he was able to successfully apply to a total synthesis of zaragozic acid C to complete his Ph.D. in 2006. Following his graduate education, Nicewicz moved back to his native New Jersey in 2007, where he was a Ruth L. Kirschstein Postdoctoral Fellow in the laboratories of Professor David W. C. MacMillan. It was during this time that Nicewicz pioneered the use of ruthenium photoredox catalysis in combination with chiral amine organocatalysis to develop a general method for enantioselective aldehyde alkylation. In July of 2009, Dave went on to begin his independent career at the University of North Carolina at Chapel Hill, where his laboratory has focused on organic photoredox catalysis for the development of novel chemical reactivity. He has received a number of awards early in his career from the University of North Carolina (James Moeser Award for Distinguished Research; Ruth Hettleman Prize for Artistic and Scholarly Achievement), industry (Boehringer Ingelheim New Investigator Award in Organic Chemistry; Amgen Young Investigator Award; Eli Lilly Grantee Award), private foundations (Packard Fellowship in Science and Engineering; Camille Prof. D. A. Nicewicz Dreyfus Teacher-Scholar Award) as well as international recognition (Society of Synthetic Organic Chemistry, Japan Lectureship Award; The 13th Hirata Award, Nagoya University). In 2015, he was promoted to the rank of Associate Professor, where he leads a research group focused on organic methodology development, catalysis and complex molecule synthesis

I am pleased to dedicate this SYNLETT Cluster in honor of Professor Shunichi Fukuzumi's 70th birthday. Prof. Fukuzumi is currently a Distinguished Professor at Ewha Womans University, Seoul, South Korea and Professor Emeritus of

Osaka University, Japan. He completed his bachelor's degree in 1973 and his Ph.D. in 1978 from the Tokyo Institute of Technology with Professor Yoshio Ono. He then travelled to the United States for a postdoctoral fellowship in Prof. Jay Kochi's laboratory at Indiana University from 1978 to 1981. Following his postdoctoral work, he returned to Japan in 1981 as an assistant professor in the Department of Applied Chemistry, Osaka University with Professor Toshio Tanaka, eventually rising to the rank of full professor in 1994. Prof. Fukuzumi has had an extraordinarily productive career, authoring over 1,100 research articles that are cited over 60,000 times in the general areas of photophysics, electron transfer and radical chemistry.

Early in his independent career, Prof. Fukuzumi published some of the first examples of photoinduced electron transfer reactions of flavins with tetra-alkyl tin reagents¹ to generate alkyl radical species. In addition, key experiments from Fukuzumi and Tanaka demonstrated that α -bromoacetophenones underwent hydrodebromination reactions with a $\text{Ru}(\text{bpy})_3^{2+}$ photoredox catalyst (Figure 1).² These seminal studies would go on to inspire a wealth of new reactivity for organic chemistry and importantly, were some of the first photoredox reactions applied to synthesis.

The field of organic photoredox catalysis in synthesis, in particular, owes Prof. Fukuzumi credit for his groundbreaking work on acridinium photooxidation catalysts and the characterization of their excited-state dynamics. In 2004, he reported the characterization and excited-state dynamics of the eponymous acridinium salt 9-mesityl-10-methylacridinium (Mes-Acr) (Figure 2),³ which is a potent one-electron photooxidation catalyst that has been utilized in a plethora of catalytic transformations,⁴ and has inspired the synthesis of numerous derivatives of this important catalyst structure.^{5,6}

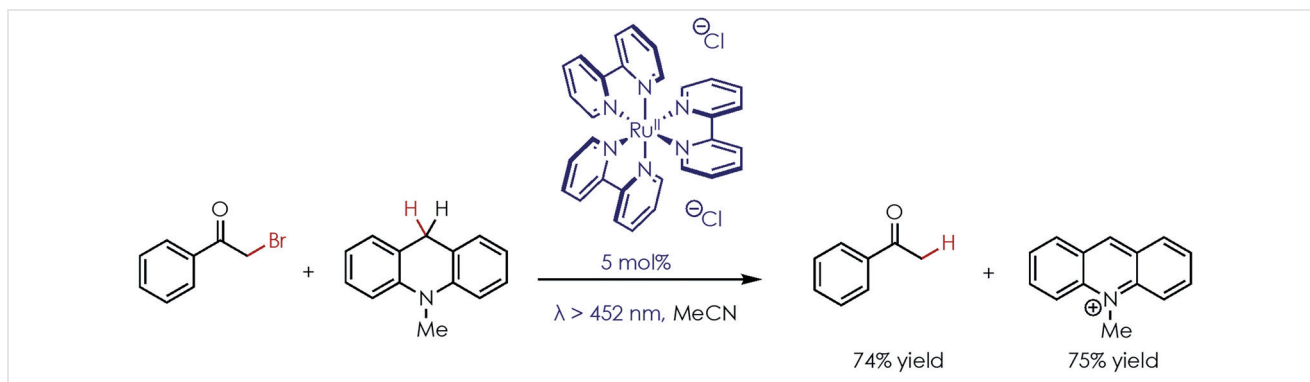


Figure 1 Fukuzumi and Tanaka's hydrodebromination of bromoacetones via photoredox catalysis

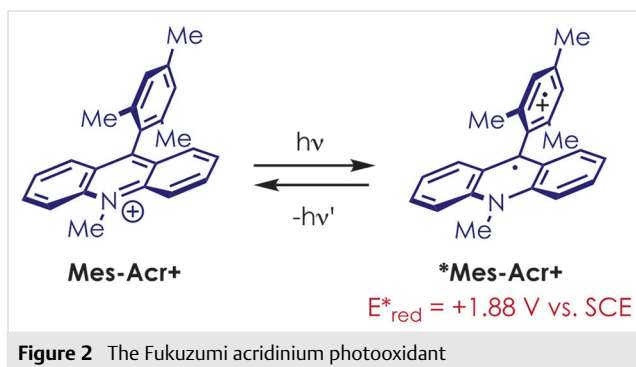


Figure 2 The Fukuzumi acridinium photooxidant

For my own selfish reasons, I felt that this cluster would be a fitting honor for Prof. Fukuzumi, as my laboratory has benefitted greatly from his seminal work; the field of organic photoredox catalysis has as well. Though we are a little past his birthday now, we are still very happy to dedicate this issue to Prof. Shunichi Fukuzumi on the occasion of his 70th birthday, and we are excited to present the invited articles in the following pages.

David Nicewicz
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Conflict of Interest

The authors declare no conflict of interest.

References

- (1) Fukuzumi, S.; Kuroda, S.; Tanaka, T. *J. Chem. Soc., Perkin Trans. 2* **1986**, 25.
- (2) Fukuzumi, S.; Mochizuki, S.; Tanaka, T. *J. Phys. Chem.* **1990**, *94*, 722.
- (3) Fukuzumi, S.; Kotani, H.; Ohkubo, K.; Ogo, S.; Tkachenko, N. V.; Lemmetyinen, H. *J. Am. Chem. Soc.* **2004**, *126*, 1600.
- (4) Romero, N. A.; Nicewicz, D. A. *Chem. Rev.* **2016**, *116*, 10075.
- (5) Fischer, C.; Sparr, C. *Angew. Chem. Int. Ed.* **2018**, *57*, 2436.
- (6) White, A. R.; Wang, L.; Nicewicz, D. A. *Synlett* **2019**, *30*, 827.