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Carbanion-Mediated Photocages

By Dr. Matthew Lukeman
Acadia University

'Photocages' are protecting groups that detach from a molecule of interest when they absorb light (usually in the UVA wavelength range), thereby releasing the molecule in its free and active form. They are used extensively to release a variety of molecules into biological systems because irradiation with brief pulses of light can be used to cause a sudden increase in the concentration of a molecule of interest. Biochemists are then able to study very rapid biological events that are triggered by this sudden concentration increase, such as the movements of muscle tissues and communication between nerve cells. Unfortunately, all currently available photocages suffer from one or more serious drawbacks which limit their utility. For example, the most popular photocage (the ortho-nitrobenzyl group) exhibits poor solubility in water, slow release rate, and forms interfering by-products.

This talk will describe the design and synthesis of the 'ketoprofenate' photocage that ameliorates some or all of the negative drawbacks associated with other available photocages. The ketoprofenate photocage shows excellent release rates, high reaction efficiencies, and excellent aqueous solubility. This photocage releases the leaving group via an entirely new 'carbanion-mediated' mechanism, and represents an entirely new class of photocages. Efforts to improve the absorption in the UVA wavelength range by moving to the xanthone, nitrophenyl, and coumarin chromophores are also discussed.

Bio

Matt Lukeman grew up in Antigonish, NS, and obtained a BSc honours degree from St. Francis Xavier University in 1999, working with Dr. Dieter Klapstein doing photoelectron spectroscopy and molecular modeling. He then moved to Victoria, BC, for Ph. D. studies with Dr. Peter Wan. He successfully defended his thesis entitled "Excited State Intramolecular Proton Transfer to Aromatic Carbon" in Dec. 2003. He moved the following month (Jan 2004) to Ottawa to begin a NSERC postdoctoral fellowship under the supervision of Dr. Tito Scaiano. It was during this time that he first became interested in the development of new photocages. Matt completed his PDF tenure in June 2005 in order to take up a faculty position at Acadia University where he is currently an assistant professor.

Matt has been happily married for more than four years to his wife Nicole, and they have a two year old daughter named Anna. Matt and Nicole are expecting their second child this upcoming November.