Photoinduced Electron Transfer Reactions Between Chloranil and 4,4Õ-Dimethoxydiphenylmethane in Zeolite NaY

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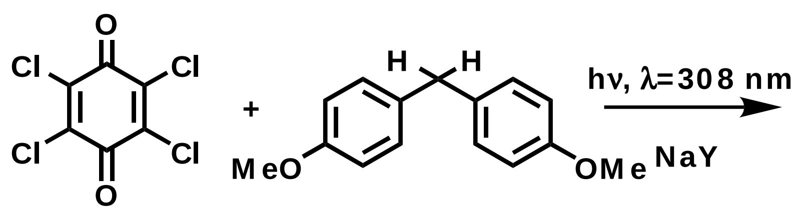
Zeolites are naturally occurring minerals comprised of SiO_4^{4-} and AlO_4^{5-} tetrahedra, which link together forming a series of molecular-sized pores, channels and cavities. Zeolites have many applications in chemistry due to their ability to encapsulate molecular guests, thereby acting as microscopic reaction vessels. Recently, zeolites have been used to study the photoinduced electron transfer (PET) reactions of incorporated guests and have been shown to participate as redox partners in these reactions. Using a nanosecond diffuse reflectance laser flash photolysis system it is possible to study the reaction dynamics of incorporated guests in zeolites.

A previous study of 4,4Õ-dimethoxydiphenylmethane (BAM), in zeolite NaY, showed that upon direct irradiation, BAM was oxidized to yield the BAM radical cation. The radical cation then decayed to the corresponding radical and cation.[1] Our experiment involved co-absorbing chloranil (Chl), a known electron acceptor, along with BAM into NaY. Irradiation of the sample using a 308 nm laser results in the selective excitation of Chl. Chl undergoes a one-electron reduction to form the Chl radical anion, leaving a hole in the zeolite framework. The hole migrates to BAM which acts as a secondary electron donor, yielding the BAM radical cation.[2] A BAM loading level dependence on the yield and behaviour of the BAM radical cation, cation and radical has led to the proposal of two distinct mechanisms of radical cation decay. At low loading levels, long-range PET *via* hole migration afforded the BAM radical cation which favoured the BAM radical as the major product. At high loading levels, direct PET between BAM and Chl yielded the radical ion pair which ultimately produced the BAM cation as the major product. In this talk I will discuss these reactions in detail and present results which support this proposed mechanism.



1. Shea, S. *Probing the Acidic Properties of Zeolites with Aromatic Hydrocarbons: A Nanosecond Diffuse Reflectance Laser Flash Photolysis Study.* (M.Sc. Thesis). Dalhousie University, 1998.
2. OÕNeill, M.A., Cozens, F.L., Schepp, N.P. *J. Phys. Chem. B.* **2001,** *105*, 12746-12758.