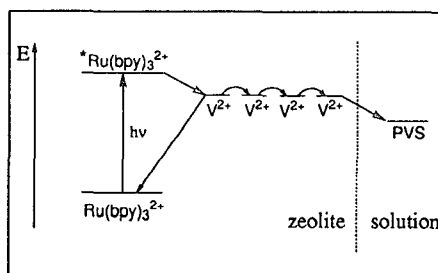


ARTIFICIAL PHOTOSYNTHESIS USING ZEOLITE HOSTS

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Zeolites and microporous materials continue to attract attention as novel hosts for photochemical reactions [1]. Zeolites are attractive because of their ability to selectively exchange and incorporate species within the void spaces and interconnecting channels, providing a spatial arrangement of molecules. Our research has primarily focused on how the process of encapsulation alters the photophysical and photochemical properties of molecules, in particular $\text{Ru}(\text{bpy})_3^{2+}$ in supercages of zeolite Y. From studies on the dynamics of intrazeolitic electron transfer as a function of the reduction potential of a series of bipyridinium ions, we find that the choice of the electron acceptor as well as the entrapment of the metal complex in the zeolite supercage is the key to retard the back electron reaction by several orders of magnitude [2]. In the high loading $\text{Ru}(\text{bpy})_3^{2+}$ -diquat-zeolite Y samples, the slowing of the back electron transfer from the bipyridinium radical cation to $\text{Ru}(\text{bpy})_3^{3+}$ allows for charge propagation via self exchange between diquat molecules. This provides an opportunity for permanent charge separation. When the migrating charge on the diquat radical within the zeolite reaches the surface, it can be transferred to a neutral viologen (PVS) in solution, as shown below [3]. The charge separation is permanent since the $\text{Ru}(\text{bpy})_3^{3+}$ trapped inside the zeolite has no contact with the anionic viologen radical in solution.



If the zeolite crystallite is reduced in size, a higher fraction of the diquat radical ions generated will reach the surface, increasing the efficiency of photochemical charge separation. Synthesis and photochemistry of ~ 10 - 15 nm zeolite X crystallites has been studied [4]. Improvements in charge separation over conventional micron sized zeolites was realized. Recently, we have focused on the synthesis of unagglomerated zeolite Y crystallites of dimensions of ~ 100 nm. It is possible to make clear solutions of these nanocrystallites in organic solvents by silylating the surface OH groups with *n*-octadecyltrichlorosilane.

