DEVELOPMENT OF A PRACTICAL PHOTOCHEMICAL
ENERGY STORAGE SYSTEM

Quarterly Report

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RESEARCH SUMMARY

During the past three-month period of this project, we submitted for publication our results on the use of a class of copper(I)-phosphine compounds as inorganic photosensitizers for the norbornadiene to quadricyclene conversion. ~~A copy of the manuscript is appended to this report.~~

We have also continued our investigation of the sensitization behavior of $\text{Ir}(\text{bipy})_2\text{-(bipy')OH}_2^{+3}$ which has been immobilized onto carboxylated silica gel. One possible drawback in using such a solid support arises from the loss of incident light due to scattering. We have examined this effect for our carboxylated silica gel (containing no sensitizer) in a variety of solvents. As summarized in Table I, norbornadiene turns out to be an almost ideal liquid phase for minimizing losses due to scattering (i.e. it gives rise to a low apparent absorbance).

TABLE I

<u>Liquid Phase</u>	<u>Absorbance*</u>
norbornadiene	0.25
methanol	1.98
ethanol	1.92
acetonitrile	>2.0
hexane	1.74
benzene	0.93
cyclohexane	1.24
tetrahydrofuran	1.53

Measured for carboxylated silica gel plus liquid
in a 1 mm cell vs. pure liquid as a reference.

Quantum yield studies reveal that the initial efficiency of quadricyclene production for the immobilized Ir sensitizer is quite high, but diminishes upon prolonged irradiation. Moreover, some disappearance of the starting material also occurs. Our current feeling is that both problems arise from the presence of trapped oxygen in the silica gel. Future work will be directed toward minimizing these difficulties with the goal of improving the long-term stability of the immobilized sensitizer.

Furthermore, a study involving the quantitative comparison of immobilized organic sensitizers has reached a reasonable level of completion. ~~A copy of a recently prepared manuscript is attached.~~

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