

Control of Electron Transfer for Efficient Oxygenation Reactions

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Electron transfer is the most fundamental reaction to govern chemical reactions. To find an effective way to control electron transfer, electronic structures of key active species were investigated in detail with various techniques including absorption, ^1H and ^2H NMR, EPR, IR resonance Raman spectroscopy and magnetic susceptibility measurements. Correlations between electronic structures and electron transfer ability are the main focus. The insight obtained from electronic structural studies is utilized to create a new catalyst, which is applied for the reactions of gaseous methane under photoirradiation.

1. Reactions of Gaseous Methane as a Substrate

One of the problems for the reactions of gaseous hydro-

carbon substrates is low solubility in organic catalyst solution. To overcome this problem, a new reaction system using fine bubbles of methane gas is constructed. In this system, an organic catalyst solution is dispersed by fine bubbles in aqueous solution. Aqueous solution serves as a coolant and also plays a role in extracting methanol product from organic catalyst solution.

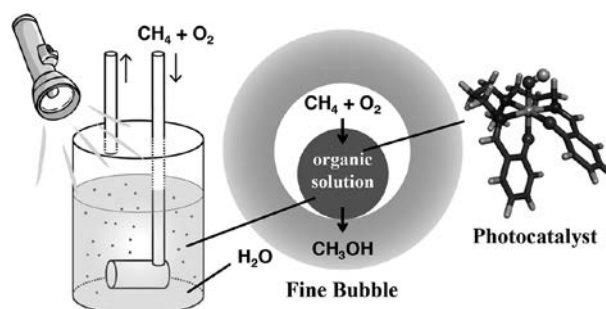


Figure 1. Photocatalytic Methane Oxygenation using Fine Bubbles under Biphasic Conditions.