Development of a New In Situ UV-vis Reflection Spectroscopy System for the Formic Acid Dehydrogenation

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In recent decades, formic acid (FA) has attracted significant attention and is regarded as one of the most promising liquid organic hydrogen carriers (LOHC).[1,2] Although many efficient catalysts for FA dehydrogenation (FADH) are developed[3-5], little research has been reported on the reaction mechanisms by *"in situ"* measurements.[6] Herein, we developed a new *in situ* UV-Vis reflection spectroscopy system, as shown in Figure 1, to monitor FADH catalyzed by Ir homogenous complexes (Ir-4DHBP) in gas-liquid mixed phase. In this system, instead of detecting the transmittance intensity conventionally, the incident light was led to the sample solution, then diffusely reflected by homogeneously scattered inorganic particles (α-Al_2O_3) in the sample solution, then diffuse reflected light was collected by the concave mirror, and finally detected by the spectrometer. When the UV-Vis transmitted spectrum during FADH was measured, we could not obtain any peaks of the solution (Figure 2, green line). Whereas, by applying this method, we succeeded to obtain the stable UV-Vis spectrum with low S/N during FADH (Figure 2, black line), in which the curve shape is consistent with the conventional UV-vis spectra of Ir complex (Ir-4DHBP) in 0.01M sulfuric acid aqueous solution (Figure 2, blue line). In this presentation, we will discuss FADH with the UV-Vis spectra by our system.

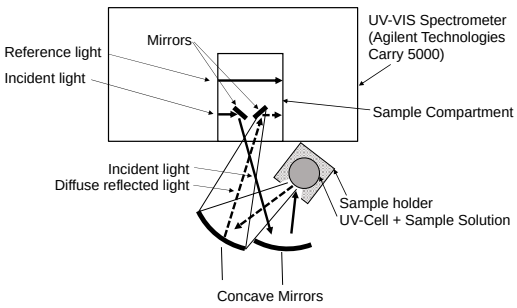

Figure 1 UV-Vis Diffuse Reflection System.

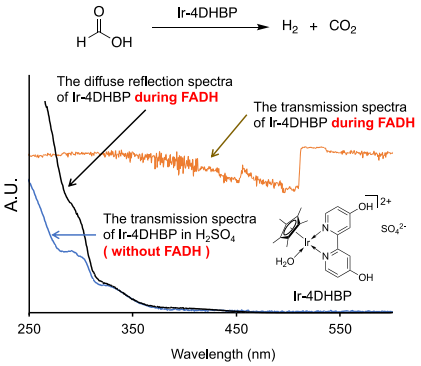

Figure 2 Obtained Spectrum under various conditions.

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