Synthesis and Photocatalytic Property of Organic–Inorganic Hybrid Ruthenium(II) Complexes with a Linked Rotaxane Structure

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Immobilization of transition metal complexes on inorganic solids synergically integrates the features of both components. The use of a π -conjugated junction molecule between the metal complexes and the inorganic surfaces is expected to provide unique organic-inorganic hybrid materials based on highly efficient electron transfer. However, the π -conjugated units are prone to aggregate through π - π interactions, resulting in reduced electrical performance.

We recently developed a new strategy using a permethylated cyclodextrin-based linked rotaxane structure for aggregation-free immobilization.¹ Along this line, we herein report the immobilization of an insulated π -conjugated molecule bearing ruthenium polypyridyl complexes on to the surfaces of metal oxides using click chemistry, directed toward photocatalysis. The Ru(II)-modified ITO substrate showed reversible redox waves based on Ru(II)-to-Ru(III) in the cyclic voltammetry measurement. Atomic force microscopy analysis showed no significant aggregation on the surface. These results indicated that this strategy is useful for the introduction of metal complexes on metal oxide surfaces. This organic-inorganic hybrid Ru(II) complex has a potential for photocatalysis such as hydrogen generation.



1) Chou, S.-Y.; Masai, H.; Otani, M.; Miyagishi, H. V.; Sakamoto, G.; Yamada, Y.; Kinoshita, Y.; Tamiaki, H.; Katase, T.; Ohta, H.; Kondo, T.; Nakada, A.; Abe, R.; Tanaka, T.; Uchida, K.; Terao, J. *Appl. Catal. B.* accepted.