

Study on surface reaction mechanism by spatio-temporal mapping

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【Outline of survey】

Reactions take place at solid surfaces heterogeneously. Kinetics and reaction mechanisms of the surface reactions have been studied by various methods, which mostly provide us the spatially averaged coverages of adsorbates involved in the reactions as a function of time. On solid surfaces molecules are often adsorbed inhomogeneously, making islands and patches, and chemical reactions are coupled to transport and diffusion of adsorbates. Thus, it is vital to probe how reactions evolve not only in time but also in the two-dimensional space for a full understanding of the heterogeneous reaction mechanism. This study develops a new method which is capable to provide information of the spatio-temporal evolution of surface reactions.

【Expected results】

This study will provide a new spectroscopic means for mapping chemical species on surfaces with an excellent time resolution. This is useful to uncover the surface reaction mechanism. Furthermore, this provides us a new way to probe reactions and charge transfer on the surfaces and interfaces of crystallines of photo-catalysts and organic semiconductors.

【References by the principal researcher】

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- (2) "Direct time-domain observation of ultrafast dephasing in adsorbate-substrate vibration under the influence of a hot electron bath: Cs adatoms on $\text{Pt}(111)$ ", K. Watanabe, N. Takagi and Y. Matsumoto, *Phys Rev Lett.*, **92**, 57401 (4 pages) (2004).

【Term of project】 FY 2005 - 2009

【Budget allocation】 81,800,000 yen

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