

Chemistry Derived by Electron Impact to Individual Molecules Adsorbed on Metal Surfaces

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Scanning tunneling microscope (STM) is a valuable tool to handle single molecules adsorbed on conductive surfaces, giving a high potential to vibrationally excite individual molecules to highly excited states. Here we demonstrate following phenomena that we have been able to handle;

1. Electron stimulated migration (ESM) for CO, which is initiated by the excitation of a high-frequency (HF) vibrational mode (C-O stretching mode). A theoretical model, which is based on the anharmonic coupling between low-frequency modes (the hindered-translational mode related to the lateral hopping) and the HF mode combined with electron-hole pair excitation, can explain why the hopping of CO is observed on Pd(110) but not on Cu(110).
2. Dehydrogenation of trans-2-butene single molecule to 1,3-butadiene through multiple excitation.

References;

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