Structures, activities, and mechanisms under the spectroscopes

the quest for unveiling the nature of active sites for highly selective CO2 hydrogenation to methanol

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Propositions

accompanying the dissertation

Structures, activities, and mechanisms under the spectroscopes
— the quest for unveiling the nature of active sites
for highly selective CO_2 hydrogenation to methanol

by

Nat Phongprueksathat

1. In *operando* spectroscopies, achieving the fastest time resolution as well as a decent signal-to-noise ratio is still the major hindrance to unraveling reaction mechanisms when distinguishing surface species based on transient kinetics is crucial. (**Chapter 4**)

2. The true holistic understanding of reaction mechanisms requires a design of a reactor (cell) that is suitable for reaction engineering (e.g. kinetic studies) and *in situ* characterization of catalyst (e.g. catalyst structure and surface species). All the information should be obtained under the identical mass transfer regime or flow patterns. (**Chapter 5**)

3. The most striking results in the research will be likely discovered through ‘serendipity’ rather than ‘machine learning’. (**Chapter 6**)

4. “Power tends to corrupt; absolute power corrupts absolutely.” Once a reviewer is taped to the absolute power that decides the fate of a manuscript, he/she must bear in mind that his/her decisions are absolutely corrupted.

5. A dying researcher would be less likely to think about his next experiment in the lab on a hospital bed.

6. If the technology disruptions are new variants of the virus, our education will decay with time like vaccine efficacy.

7. An expert in one field can be an ignorant person in another. A prestigious STEM professor could be an idiot in politics or social science. *(STEM = Science, technology, engineering, and mathematics)*

8. “Men went after perfection, but women went after wholeness.” Acknowledging that the career is not the only thing women are pursuing is the first step to keeping more women in academia.

9. Some level of 'disagreeableness’ is a useful trait one should acquire through PhD.

10. Human trust cannot be built virtually via Zoom meetings, that is why people fly across the sea to meet each other despite producing huge amounts of CO_2.

These propositions are regarded as opposable and defendable, and have been approved as such by promotor prof. dr. A. Urakawa and co-promotor prof. dr. E.A. Pidko