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Coach	**Supervisor(s)**	**Funding**
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Development of size-controlled supported Pd and Cu catalysts for CO_2 hydrogenation to methanol

Aim

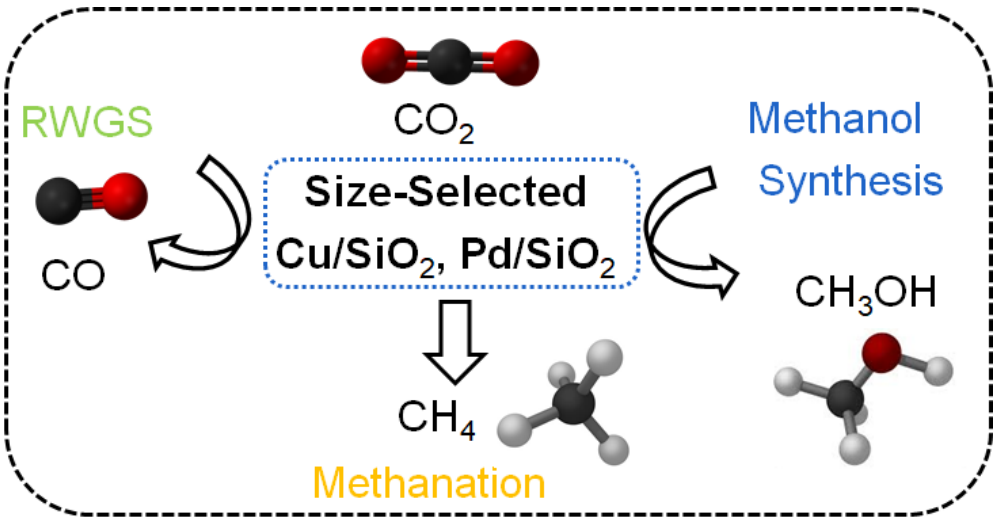
Atomic-scale control of metal particle size to boost the catalytic performance of the supported Pd and Cu catalyst during CO_2 hydrogenation

Justification

Recently, heterogeneous single-atom metallic catalysts have received considerable attention due to their unique catalytic properties different from bulk metal sites. The objective of this master thesis will be studying such properties during CO_2 hydrogenation to methanol, a vital compound for many industries. Only a few reports are dealing with this concept for methanol synthesis and the effect of metal particle size from single-atom to the bulk of atoms is missing. In this regard, size-controlled synthesis of the metal such as Pd or Cu on an inert support such as silica or alumina is crucial. Firstly, different synthesis approaches will be used to precisely control the metal particle size of the synthesized catalysts. In the second step, the detailed kinetics of the CO_2 hydrogenation will be investigated to get insight into the effect of the metal particle size on this reaction. Next, the synthesized catalysts will be characterized using different characterization techniques to correlate their properties with catalytic results. The outcome of this study will be relevant for further research on the development of a highly active and selective catalyst for CO_2 hydrogenation to methanol.

Program

1. Literature study : Studying catalytic methanol synthesis state-of-the-art.
2. Synthesis of supported size-controlled Pd and Cu catalysts.
3. Kinetic study of the catalytic CO_2 hydrogenation over synthesized catalysts.
4. Characterization of the developed catalysts.
5. Uncovering the effect of metal particle size on the selective methanol synthesis.



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