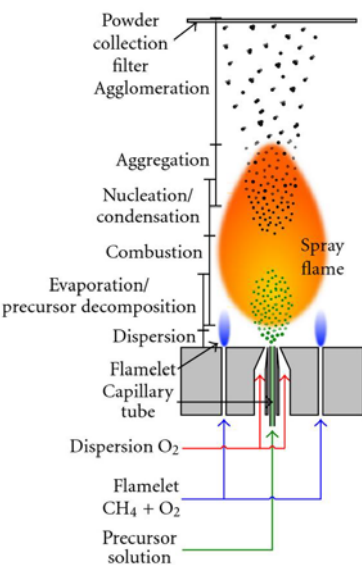


## Direct hydrogenation of CO<sub>2</sub> in value-added chemicals(C<sub>1</sub>-C<sub>3</sub>) over Ce-based catalysts

### Background

The development of industrialization leads to the subsequent massive generation of CO<sub>2</sub> has caused many environmental problems such as global warming. Typically, utilization of CO<sub>2</sub> will be produced in two ways: capture and storage or chemical conversion.

Mitigation of CO<sub>2</sub> concentration via producing hydrocarbons is a promising way to convert CO<sub>2</sub> into fuels. The catalytic hydrogenation of CO<sub>2</sub> using H<sub>2</sub> is considered as a potential path forward for the production



of lower olefins, higher hydrocarbons, methanol, and higher alcohols.<sup>1</sup>

Among the used catalysts, ceria (CeO<sub>2</sub>) and ceria-based materials has received additional attention in the last decade due to unique redox properties and its oxygen storage capacity (OSC). Additionally, CeO<sub>2</sub> is widely used reducible oxide support for metal nanoparticles, owing to strong metal-support interaction, which leads to stabilization and high dispersion of active components.

Recent work of our group shows that the presence of very small cobalt clusters on the surface of CeO<sub>2</sub> leads to outstanding activity in CO<sub>2</sub> hydrogenation.<sup>2</sup> For further understanding of the nature of species responsible for CO<sub>2</sub> hydrogenation and the produced product, we are aiming to carry out studies of the catalytic activity of Ce-based catalysts (Co-, Ni-, Fe-), prepared by using Flame Spray Pyrolysis, in the reaction of CO<sub>2</sub> hydrogenation and its structure.

The project will involve synthesis, advanced characterization (FTIR, XRD, XPS, Raman, FTIR) and testing of CeO<sub>2</sub>-based catalysts in the CO<sub>2</sub> hydrogenation.

### Techniques used:

Catalytic testing setup equipped with GC and MS; XRD; FTIR; UV-vis; TPR-H<sub>2</sub>; XPS; Raman

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