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## Models for heterogeneous catalysts: surface and subsurface chemistry

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Model systems are useful to establish structure/morphology reactivity relations in heterogeneous catalysis. Here we use a Metal-Insulator-Metal (MIM) structure to advice CO<sub>2</sub>.

We had shown before that ultra-thin oxide films could be used as effective barriers to charge Au islands with electrons from the support. The idea is to use the electrons stored in the islands to activate molecules by electron transfer. Such a molecule is the energy economy relevant carbon-dioxide for example. We demonstrate adsorption of CO<sub>2</sub> at gold islands and the reversible formation of  $^-\text{CO}_2$  and oxalates based on information from microscopy and spectroscopy.

We show how to transfer those ideas to bulk materials, where we use appropriate dopants within the support material to provide the electron source. The electron transfer to Au islands as well as the activation of oxygen will be demonstrated.