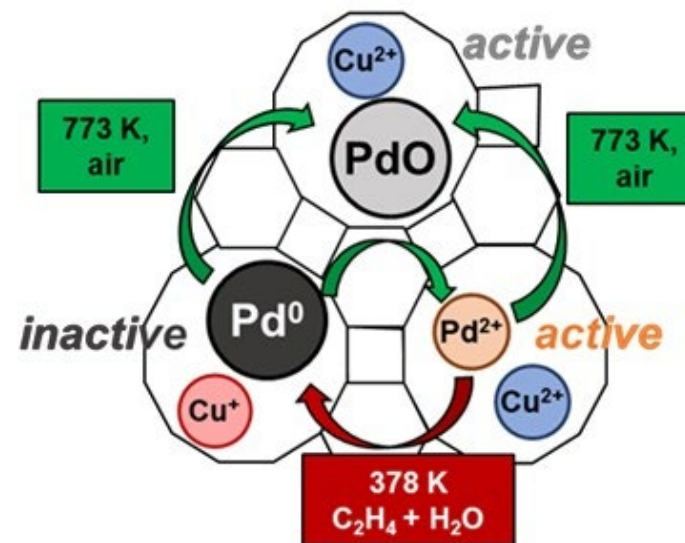


Catalysts, which speed up chemical reactions, are a cornerstone of the chemical industry and contribute to 35% of world GDP. Chemical reactions happen at the nanoscale, where the material surface structure determines the effectiveness of the reaction. Zeolites are silica-based materials with ordered pores, which can stabilize tiny clusters of metal atoms and even single metal ions. Changes in the arrangements of these atoms are crucial to the catalyst performance, but are poorly understood.

Wisconsin MRSEC researchers investigated how metal ions of palladium and copper, stabilized in zeolites, rearrange when exposed to high temperatures or reactive environments. They used cutting-edge X-ray characterization to 'see' structural changes in real time. Metal ions rearrange when exposed to reactive environments and agglomerate into clusters over time, which no longer work as well. These clusters can be returned active catalysts through controlled high-temperature treatments. These insights inform the design of efficient catalysts for energy applications.



Wisconsin MRSEC researchers studied how palladium and copper ions in zeolite pores agglomerate into nanoclusters during chemical catalytic reactions and during high-temperature treatments that pull them apart again.