'Chainmail catalysis' improves efficiency of CO oxidation at room temperature

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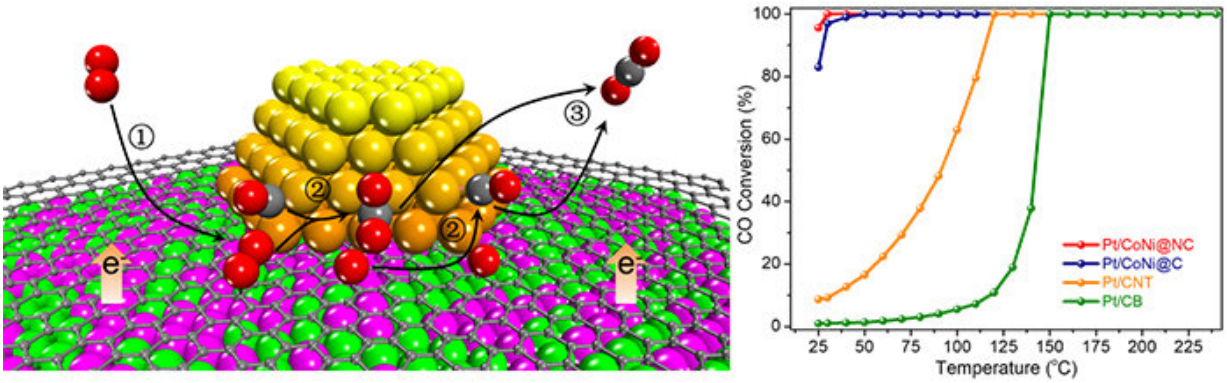

Graphene-isolated Pt from CoNi nanoparticles (Pt|CoNi) for efficiently catalytic CO oxidation. Credit: HU Jingting

CO oxidation at room temperature is significant for gas purification. Pt promoted by 3d transition metals (TMs) is a promising candidate for this reaction. However, TMs are prone to be deeply oxidized in an oxygen-rich atmosphere, leading to low activity.

Recently, a research group led by Prof. Deng Dehui from the Dalian Institute of Chemical Physics (DICP) of the Chinese Academy of Sciences (CAS) designed a chainmail catalysis of graphene-isolated Pt from CoNi nanoparticles (Pt|CoNi) for CO oxidation at room temperature.

The study was published in *Nature Communications* on Oct. 04.

CoNi alloy was protected by ultrathin graphene shell from oxidation and therefore modulated the electronic property of Pt-graphene interface via electron penetration effect. It achieved near 100% CO conversion at room temperature, while there were limited conversions over Pt/C and Pt/CoNiOx catalysts.

By experiments and theoretical calculations, the researchers indicated that CO could saturate Pt sites, but O_2 could adsorb at the Pt-graphene interface without competing with CO, which facilitated the O_2 activation and the subsequent surface reaction.

"The graphene-isolated system in this work is distinct from the classical metal-metal oxide interface for catalysis, and it provides a new thought for the design of heterogeneous catalysts," said Prof. Deng.

More information: Yong Wang et al, Electron penetration triggering interface activity of Pt-graphene for CO oxidation at room temperature, *Nature Communications* (2021). DOI: 10.1038/s41467-021-26089-y

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