# Engineering a homogeneous alloy-oxide interface derived from metal-organic frameworks for selective oxidation of 5-hydroxymethylfurfural to 2,5-furandicarboxylic acid

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**Abstract**

The selective oxidation of 5-hydroxymethylfurfural (HMF) to 2,5-furandicarboxylic acid (FDCA) is an important biomass conversion reaction. However, the multiple intermediates of the reaction make the catalyst design challenging. We engineered an active and selective catalyst with an active interface between Au-Pd alloy nanoparticles (NPs) and cobalt oxide supports via calcination of a composite of NPs encapsulated in metal-organic frameworks (MOFs). The catalyst shows an effective HMF-to-FDCA oxidation with total conversion and 95 % yield by 10 % hydrogen peroxide solution at 90 °C in one hour under atmospheric pressure. The mechanistic study shows that the engineered interface promotes the formation of hydroperoxyl radicals and dioxygen molecules, which accelerate the oxidation of reactive intermediates to FDCA. This work demonstrates the advantage of using MOF composites as a precursor to generate complex but active interfaces with a strong interaction between the metal and metal oxides.