# Super CO tolerant anode catalysts for fuel cells – A new generation electro-catalysts based on organic metal complexes

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Abstract: In the stationary fuel cell, fuel gas such as city gas is first reformed into hydrogen, and then fed into the cell to generate electric power. Thereby byproduct impurity CO forms in the reformed gas, and when this exceeds a few ppm, the fuel cell performance degrades drastically. While it has been known that Pt-Ru alloy catalyst is resistant to CO, it is expensive and still fails to protect the electrode when the concentration of CO becomes higher than 25 ppm. From this motivation, new catalysts are developed based on organic metal complex as a co-catalyst for platinum, with much better performance than that of the conventional catalyst. The catalyst is prepared by mixing platinum precursor with organic metal complex, incorporating the mixture over carbon particles and baking in inert gas. This provides adequately stable catalyst. The catalyst is tolerant to CO at the concentration higher than 100 ppm. Such a high resistance to CO is world first achievement, and the practical application of this catalyst will mitigate strict requirements of fuel reformer for reducing CO and bring forth a spin-off effect of saving cost of the reformer itself.

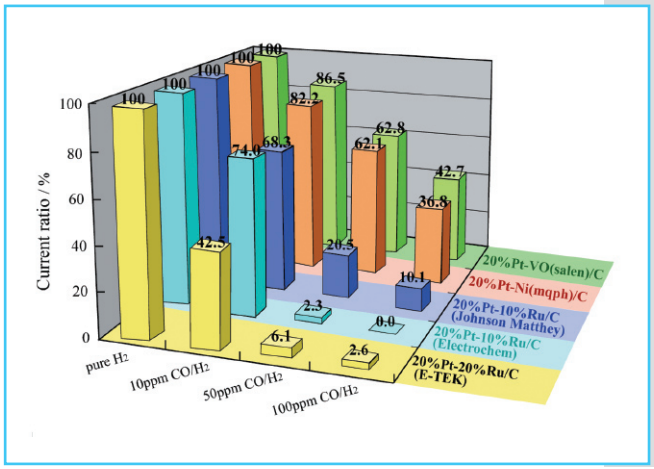


Fig. Performance of new catalysts for the anode of fuel cells in comparison with that of Pt-Ru.



# Detoxification of Dioxins under Mild Conditions

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Dioxins, which include polychlorinated dibenzo-*p*-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), and coplanar polychlorinated biphenyls (co-PCBs), are chlorinated organic compounds with high toxicity. In this study, detoxification of dioxins was carried out in a solution of NaOH in 2-propanol in the presence of an alumina-supported palladium catalyst ($Pd/Al_2O_3$). When dioxins were extracted from fly ash, which had been collected in a commercial solid-waste incinerator, and were treated by using this system at 82 ℃ for 3 h, the concentrations of dioxin homologues decreased nearly to the experimentally detectable limits. The toxicity reduction was calculated to be > 99.96 %. We studied the reaction mechanism and revealed that chlorine atoms of dioxins were replaced stepwise by a hydrogen atom of 2-propanol and consequently dioxins were transformed to chlorine-free compounds.

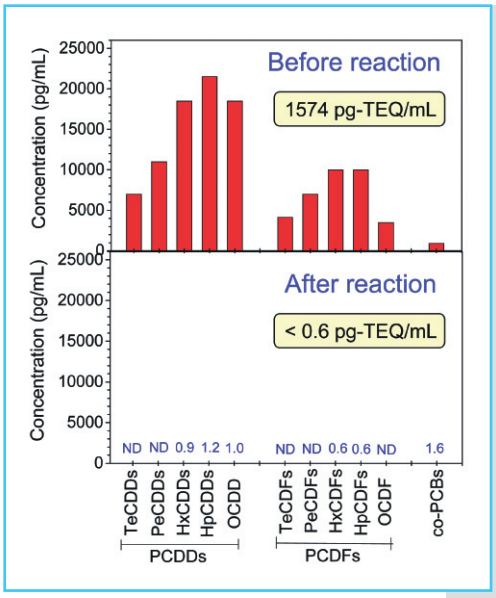


Fig. Detoxification of dioxins extracted from fly ash.
Reaction conditions; 2-propanol (20 mL), NaOH (80 mg), $Pd/Al_2O_3$ (200 mg), 82°C, 3 h.