# Effects of platinum loading on YSZ and preparation method on non-faradaic electrochemical modification of catalytic activity (NEMCA) on propane oxidation

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The effects of electrochemical promotion of catalysis (EPOC) or non-faradaic electrochemical modification of catalytic activity (NEMCA) of isolated Pt catalyst on $Y_2O_3$-stabilized-$ZrO_2$ (YSZ) disk, an $O^{2-}$ conductor, were studied with the catalytic reaction of propane oxidation, which was chosen to model the combustion of residual hydrocarbons in catalytic converters. In electrochemical promotion, the catalyst was electrochemically promoted by applying electric current or potential between two terminal Au electrodes supported on solid electrolyte (wireless configuration). Catalytic performances were studied under stoichiometric amount of oxygen at atmospheric pressure, in the range of temperature of 200–400 °C by application of electrical potential of 0–30 V. The induced rate increase ($\Delta r$) exceeded the corresponding electrochemically controlled rate I/nF of $O^{2-}$ transfer through the solid electrolyte, resulting in the faradaic efficiency $\Lambda = \Delta r/(I/nF)$ up to $4.45 \times 10^3$ achieved at 300 °C with cell voltage of 5 V for a sputtered Pt loading of 0.1105 mg Pt/$m^2$. Sputtered electrochemical catalysts presented higher Pt dispersion and significantly larger catalytic activity, which may be related with formation the of $PtO_X$ species during electrochemical promotion.

**Keywords:** NEMCA; Propane oxidation; Electrochemical catalysts