Activity function for predicting ethanol oxidation performance of Ag/Al_2O_3 catalyst as a function of Ag loading

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The emission of oxygenated hydrocarbons, mostly ethanol, can be controlled by the oxidation catalyst with improved low temperature activity and the low cost of catalytic formulations. The "activity function" has been utilized to predict the change of catalytic performances without experimental efforts. We have developed an activity function predicting the catalytic performance of the ethanol oxidation over Ag supported on alumina catalysts as a function of the Ag loading from 1 to 7 wt.%. The activity function was derived from the catalyst characteristics, particularly for the normalized active metal surface area (MSA) varied by the Ag content in the catalyst, describing the non-linear increase of the catalytic activity (a). The reference reaction kinetics of the 7 wt.% Ag/Al_2O_3 was postulated on the basis of the L-H mechanism with 6 elementary surface reactions. In combination with the activity function and the reference reaction kinetics, the overall kinetic model has well simulated the catalytic performance of the ethanol oxidation as a function of the Ag content.