Composite Metal Catalysts for Oxidation of Hydrocarbons

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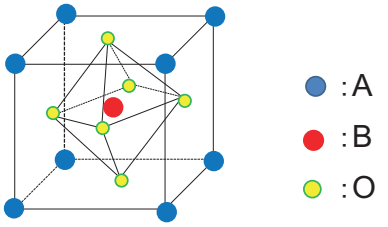
Synopsis

Combined metal microparticles are applied for hydrocarbon oxidation which is industrially and environmentally important

・Miniaturization of particle by liquid phase synthesis
・Valence control by elemental substitution

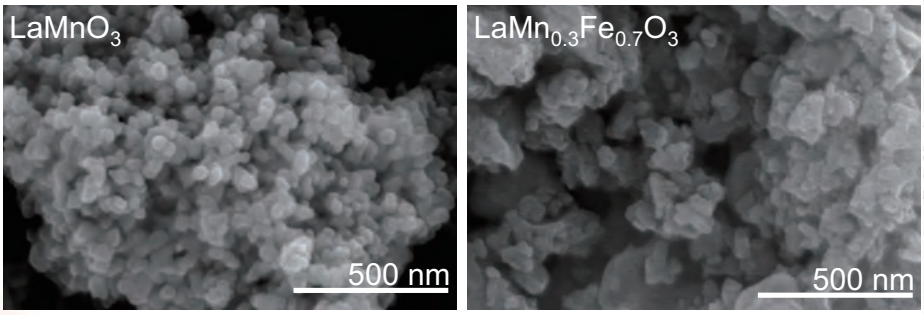
Development for highly active catalyst

Perovskite-type oxides were employed as combined metal compounds

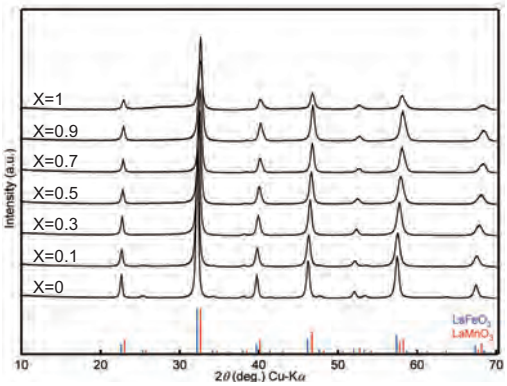


Features of perovskite-type oxide (ABO_3)
・Releasing lattice oxygen easily
・High oxygen-ion conductivity

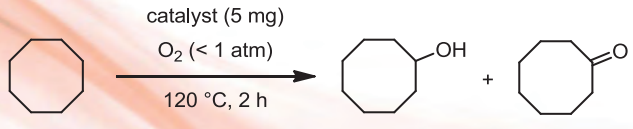
Electron microscope images of synthesized catalyst（SEM images）



XRD patterns of $LaMn_xFe_{1-x}O_3$

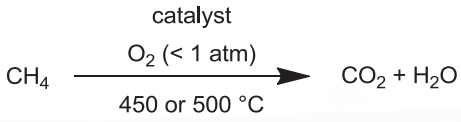


Direct oxidation of hydrocarbons with catalyst and oxygen



1 2 3

entry	Catalyst	Yield(2+3)/%
1	$LaFeO_3$	3.31
2	$LaCoO_3$	3.41
3	$LaMnO_3$	4.02
4	$LaFe_{0.1}Al_{0.9}O_3$	5.75
5	$LaMn_{0.3}Fe_{0.7}O_3$	5.54
6	$LaMn_{0.3}Cu_{0.7}O_3$	4.87
7	$La_{0.7}Ce_{0.3}MnO_3$	4.64



entry	Catalyst	Recovery of CH_4/%	
		450 °C	500 °C
1	$LaMnO_3/Al_2O_3$	82	68
2	$LaFeO_3/Al_2O_3$	96	92
3	$LaMn_{0.3}Fe_{0.7}O_3/Al_2O_3$	84	71
4	Al_2O_3	98	99
5	Pt/Al_2O_3(Pt 1wt%)	70	44

※entries 1-3 : mixing catalyst and Al_2O_3 with motor (catalyst content 5 wt%)
entry 5 : made by heating after solution impregnation method

Besides direct oxidation of various hydrocarbons,
these catalysts can be applied for catalytic combustion, purification of exhaust gas.

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