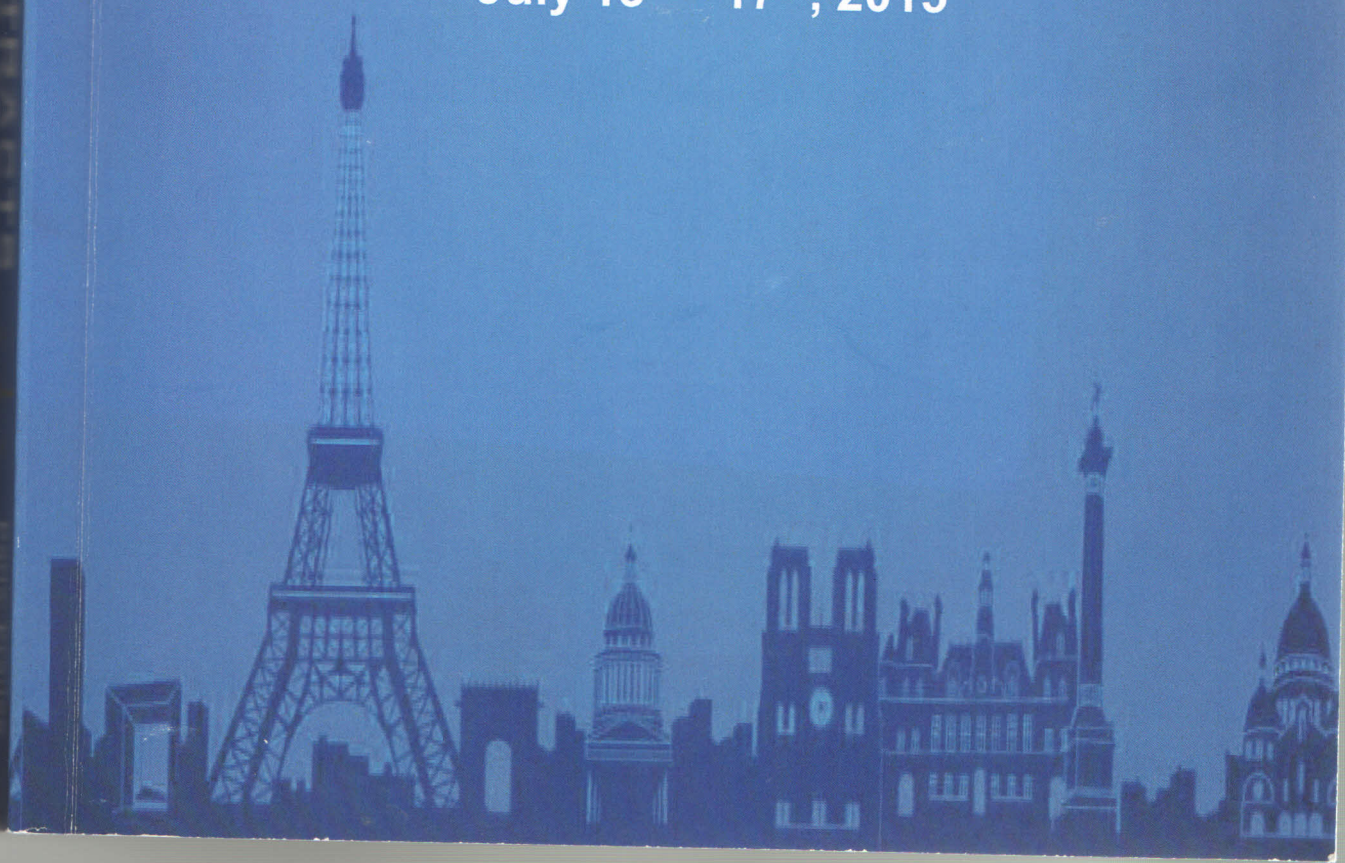
22nd International Symposium on Metastable, Amorphous and Nanostructured Materials

BOOK OF ABSTRACTS

ISMANAM 2015

Paris, France

July 13th - 17th, 2015



22nd International Symposium on Metastable, Amorphous and Nanostructured Materials

Paris, France

July 13th - 17th, 2015

Organizers

A. R. Yavari and K. Georgarakis

Table of Contents

Nanosized Pt-Ru Catalysts in Selective Oxidation of Methane into Synthesis-gas

PS2-043

S.A. Tungatarova[1*], G. Xanthopoulou[2], T.S. Baizhumanova[1], K. Kassymkan[1], M. Zhumabek[1]

[1]Laboratory of Organic Catalysis, D.V. Sokolsky Institute of Organic Catalysis and Electrochemistry, 142, Kunaev str., 050010, Almaty, Kazakhstan
[2]Advanced Ceramics Laboratory, Institute of Materials Science, NCSR Demokritos, 15310, Aghia Paraskevi Attikis, Athens, Greece

*Correspondent: tungatarova58@mail.ru

Great attention is paid to the production of synthesis gas and fuel compositions with nanocluster of catalysts by reaction of selective catalytic oxidation of methane and other alkanes in the last 10-15 years. Determination of the composition of active phase of catalyst by studying of oxidation of 1.6% CH4 in the presence of 0.8% O2 at 1173K and short contact time were conducted. The process is carried out entirely (XCH4 = 100%) with the formation of synthesis gas without by-products (H2/CO = 2.0) with high selectivity by H2 and CO (100%) only at atomic ratio of Pt-Ru = 2:1, 1:1 (0.68 at % Pt - 0,32 at % Ru, 0,55 at % Pt - 0,45 at % Ru) for series of Pt, Ru, and Pt-Ru catalysts with different ratio of elements. The presence of nanosized PtRu clusters in Pt-Ru contacts greatly facilitates the interaction of CH4 with O2 because of the possible separate adsorption and activation of components in different parts of the cluster: CH4 - on Pto, and O2 - on Ruo, as well as because that the exchange in the clusters and the transfer of electron proceed at high speeds. Such phase composition is main condition for optimum selective oxidation of CH4 to synthesis gas. It is preserved in the process of high temperature reaction.

Finely Dispersed Manganese Catalyst of the Catalytic Combustion of Natural Gas

PS2-044

Z.T. Zheksenbaeva, S.A. Tungatarova*, E. Shaizada, T.S. Baizhumanova, D.B. Abdukhalykov, K. Kassymkan, M. Zhumabek

Laboratory of Organic Catalysis, D.V. Sokolsky Institute of Organic Catalysis and Electrochemistry, 142, Kunaev str., 050010, Almaty, Kazakhstan

*Correspondent: tungatarova58@mail.ru

It is known that environmentally friendly flameless combustion of hydrocarbons without formation of nitrogen oxides is an important way to dispose of natural gas. In this regard, the development of energy-saving and environmentally friendly catalytic combustion technologies of light hydrocarbons for heating of greenhouses and use of formed CO_2 for carbon dioxide additional fertilizing of plants is the aim of the present work. Polyoxide heat resistant (up to 1473 K) highly efficient Mn-containing catalysts for deep oxidation of methane and propane-butane in vapor-air mixture have been developed. Prototype of catalytic heat generator was created for ecologically clean methane and propane-butane burning. Pilot testing of catalytic heat generator for heating of greenhouses were conducted and carbon dioxide fertilizing of plants by combustion products of propane-butane mixture was carried out. Using BET, XRD, TEM and ESDR methods it was shown that the Mn catalyst contains crystalline CeO_2 and nanoparticles of Mn_2O_3 (d = 30-100Å), the amount of which decreases by heating to 1173K through a partial interaction with rare earth elements with the formation of $La(Ce)MnO_3$, $CeAlO_3$, then hexaaluminate $LaMnAl_{11}O_{19}$ at 1273-1473K and BaMn-oxides, which are active in oxidation of CH_4 to CO_2. Such phase composition is main condition for optimum selective oxidation of CH_4.