

CONCLUSION

During the three decades which have elapsed since the discovery of the first reactions of alkanes in solutions of metal complexes, this field of chemistry has developed vigorously. There is no doubt that one may expect the discovery of new, especially catalytic, processes with the participation of methane and its homologues, which will find practical applications. In turn, this will intensify the interest in alkanes from the standpoint of their involvement in selective chemical processes. The new chemistry of alkanes thus established will be in line with the ever more urgent need for economy in the consumption of the existing resources of this chemical raw material on our planet.

The biomimetic approach for the search and development of new important reactions is a fruitful method at present and promising in the future. The existence in living nature of catalytic reactions unknown in chemistry encourages the search for their non-enzymatic analogues. More and more complicated enzymatic systems functioning in living organisms will be understood using new methods of investigation, and we will learn how to mimic these complicated systems in chemical laboratories. Eventually, when the origin of life and the chemical evolution of the biological systems will be understood sufficiently well, self-developing and self-perfecting catalysts can be visualized.

ABBREVIATIONS

AIBN = azobis(isobutyronitrile)

BDE's = bond dissociation enthalpies.

Cp = cyclopentadienyl. Cp* = pentamethylcyclopentadienyl.

KIE = kinetic isotope effect.

M= multiple exchange factor denoting the average number of hydrogen atoms exchanged within one contact.

MMO = methane monooxygenases.

NIH shift = transfer of a hydrogen (deuterium) atom to a neighboring position relative to that at which hydroxylation takes place (NIH = National Institute of Health).

NHPI = *N*-hydroxyphthalimide.

Organyl group = alkyl, aryl, vinyl, acyl, etc. group which is bound to M via a carbon atom.

Ox = oxidant. Red = reductant.

PINO = phthalimide *N*-oxyl

Porph = porphyrinate.

Rad, R = radical. Alk = alkyl radical. Ar = aryl radical.

SET = single-electron transfer.

Tp = hydridotris(pyrazolyl)borate, HB(Pz)₃. Pz = pyrazolate. Tp* = hydridotris(3,5-dimethylpyrazolyl)borate, HB(3,5-Me₂Pz)₃,

C(1) : C(2) : C(3) : C(4) = the relative normalized (taking into account the number of hydrogen atoms at each of the carbon atoms) reactivities of hydrogen atoms at carbon atoms 1, 2, 3 and 4 of the linear hydrocarbon chain.

1° : 2° : 3° = the relative normalized (taking into account the number of hydrogen atoms at each of the carbon atoms) reactivities of hydrogen atoms at primary, secondary, and tertiary carbon atoms of the branched alkane

5/6 effect = the normalized ratio of the rate constants for cyclopentane and cyclohexane.

“ \longrightarrow ” = agostic bond.

* = a vacant site.

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**Volume 1 is previously published under the Series Title:
Homogeneous Catalysis in Organic and Inorganic Chemistry.*