Pharmaceutical Analytical Chemistry: Open Access

OPEN ACCESS Freely available online

Perspective

Importance of Organometallic Compounds in Catalysis

Ahmed Nassar*

Department of Pharmaceutical Sciences, Manipal College of Medical Sciences, Dharan, Nepal

DESCRIPTION

Organometallic compounds are a vast class of chemicals that have played an important part in the evolution of chemistry. Any component of a class of compounds containing at least one metal-to-carbon link in which the carbon is part of an organic group is an organometallic compound. They are widely used in the laboratory and industry as catalysts and intermediates. Compounds in this class include ferrocene, a highly stable molecule composed of an iron atom split between two hydrocarbon rings. Organometallic compounds are normally classified according to their metal as either main-group or transition metal compounds. In the periodic table of elements, the main-group metals of organometallic compounds are generally those of the S-block (groups 1 and 2) and the heavier elements of the p-block (groups 13-15). Transition metals contain elements from the d- and f-blocks (groups 3–12). Organometallic compounds have a wide range of physical and chemical characteristics. Most are solids, particularly those with ring-shaped or aromatic hydrocarbon groups, although others are liquids and some are gases. Their heat and oxidation stability varies significantly. Some are quite stable, but several electropositive element compounds, such as lithium, sodium, and aluminum, are spontaneously combustible. Many organometallic compounds, particularly those that are volatile, are extremely hazardous. The characteristics of organometallic compounds are affected by the type of carbon-metal bonds involved. Some are conventional covalent bonds, in which atoms exchange electron pairs. Others are multicenter covalent bonds, which involve more than two atoms in the bonding. Ionic bonds are a third form in which just one atom donates the bonding electron pair. In donor-acceptor bonds, the metal atom is linked to hydrocarbons via numerous carbon-atom bonds. Electrons are frequently shared unequally when metal atoms establish covalent connections with carbon atoms. As a result, the connection has become polarized, with one end being more negative than the other. The strength with which the metal atom binds electrons determines the extent of polarization. The polar power of organometallic compounds ranges from methyl potassium, where the link is essentially identical. Some ionic bonds, like lead, binds with carbon with very low polarization.

Catalysts are compounds that accelerate a reaction but are not consumed in the process. Catalysts can be found in nature, industry, and the laboratory. Many organometallic compounds are used as catalysts in the chemical industry and laboratories.

Hydrogenation

The overall result of catalytic hydrogenation of alkenes is the addition of molecular hydrogen across an alkene's double bond. The reactants, H_2 and ethylene (C_2H_4), enter the cycle by reacting with the complex to form a hydride complex and an alkene complex in succession. The hydrogenated product leaves the cycle with the regeneration of the coordinately unsaturated Rh complex. As long as hydrogen gas and ethylene are available, the cycle will continue. The catalysts are the rhodium complexes in the solution, which are not consumed in the process. Rhodium, which is more expensive than platinum, may be employed even in low-cost catalytic processes since the rhodium is not consumed. This sort of catalyst is also utilized in the manufacture of medications such as levodopa (or L-dopa), which is used to treat Parkinson's disease.

Hydroformylation

The addition of carbon monoxide and hydrogen to alkene results in the formation of an aldehyde with one extra carbon atom than the original alkene. This catalytic process is used in the petrochemical sector with $Co_2(CO)_8$ or other rhodium catalysts. A succession of organometallic intermediates is used in the catalytic cycle. The aldehydes generated by hydroformylation are often converted to alcohols, which are utilized as solvents, plasticizers, and in detergent production. The volume of manufacturing is massive, with millions of tons produced each year.

CONCLUSION

Lead, tin, and mercury organometallic compounds are all commercially important. Many organo-tin compounds, for example, are utilized as medicines, insecticides, polyvinyl chloride stabilizers, and fire retardants. Because of its toxicity, methyl-mercury has produced major pollution concerns. As a

Correspondence to: Dr Ahmed Nassar, Department of Pharmaceutical Sciences, Manipal College of Medical Sciences, Dharan, Nepal, E-mail: ahmedwafa2y86@yahoo.com

Received: 02-Jun-2022, Manuscript No. PACO-22-18768; **Editor assigned:** 07-Jun-2022, Pre QC No. PACO-22-18768 (PQ); **Reviewed:** 21-Jun-2022, QC No. PACO-22-18768; **Revised:** 28-Jun-2022, Manuscript No. PACO-22-18768 (R); **Published:** 04-Jul-2022, DOI: 10.35248/ 2471-2698.22.7.159.

Citation: Nassar A (2022) Importance of Organometallic Compounds in Catalysis.7: 159.

result, strict limitations on mercury flow from chemical factories into rivers, lakes, and seas have been implemented. Many transition-metal atoms readily combine with carbon monoxide to generate metal carbonyls, which are a kind of organometallic. Tetracarbonylnickel, a volatile nickel chemical that constituted the foundation of a nickel purification method, was one of the first to be identified. Metal carbonyls are used as catalysts in a variety of petrochemical processes.