



TECHNICAL DOCUMENT OPERATION MANUAL

PREMIUM 1ST IN CLASS
FUEL CATALYST TABLET



GOVVI BOOST



Reduces Harmful Emissions
Boosts Power & Performance
Cleans Carbon Deposits
Improves Fuel Stability
Improves Fuel Burn
Improves Mileage

GOVVI Boost Fuel Tablets

One package contains five tablets.
One tablet treats 15 to 20 gallons of fuel.

Molecular Behavior of Petroleum and Oil Derivatives (Gasoline and Diesel) Inside the Combustion Chamber

Oil and its derivatives, gasoline and diesel, tend to behave in an UNSTABLE manner inside the combustion chamber. This molecular instability causes the formation of solid residues called oxides due to the acid process in the combustion chamber. This acid process results in CARBONIZATION, and because the oxides are resistant to high temperatures, the carbonized ore adheres to the metals used in the various components of an engine causing build up and eventually damage.

Important Note: This oxidative process will occur in any type of engine (new or old) operated by some type of fossil fuel.

This oxidative process will cause the engine of your vehicle to consume more fuel, pollute the environment, increase preventative and corrective maintenance costs, and lose power.

- CARBONIZATION IN SPARK PLUGS
- CLOGGING OF OIL / GASOLINE FILTER
- DAMAGE TO OXYGEN SENSORS
- LOSS OF ENGINE COMPRESSION
- INCREASE IN POLLUTING GASES
- HIGHER FUEL CONSUMPTION
- MORE FREQUENT OIL CHANGES
- INCREASE IN ENGINE TEMPERATURE

The 1973 Nobel Prize & GOVI

FROM THE UNSTABLE TO THE STABLE

Geoffrey Wilkinson & Ernst Otto Fischer

Wilkinson & Fisher (independently of each other) managed to formulate a stable compound consisting of a metal element in the middle of two five-sided carbon rings.

The GOVI formulation acts on exposed carbonyl compounded branches that are acidic and attracted to the GOVI tablet's oxide to initiate a dehydration process.

The dehydration process produces a molecule of water (H_2O), which decomposes at high temperatures releasing a molecule of carbon dioxide (CO_2). This process eliminates the links of the aromatic chains and has a reversible effect on the carbon deposits.

In simple terms, the GOVI technology reverses damage caused by carbonization and reduces further damage to the vehicle and the environment. It also adds energy to the thermodynamic process already taking place inside an engine to deliver more output energy from the engine. This extra energy can be used to either increase engine output power (if the amount of fuel input is kept constant) or reduce the engine's fuel intake (if the amount of output power is kept constant).

- **REDUCES TOXIC GAS EMISSIONS**
- **DE-CARBONIZES CARBON RESIDUE LEAVING A CATALYTIC VARNISH ON THE ENGINE**
- **ADDS ENERGY TO THE NET RESULT OF MORE FUEL EFFICIENCY**

WHY SHOULD I TRUST GOVVI?

Organometallic technology is based on six Nobel Prizes in chemistry.

In July of 2015, this technology was approved in Mexico by the IMP (Mexican Petroleum Institute).

The Department of Defense and the Aerospace Industry in the United States have used similar organometallic technology to what is incorporated by the manufacturer of the GOVVI tablet. More than 400 million miles of tests have been conducted in the United States with positive results.

The GOVVI tablet catalyst technology has been in operation since the summer of 2010, in the United States. There is no record of damage to engines or the environment due to the use of this technology in combustion engines. Further, the use of this technology in combustion engines has not led to any lawsuits on record in the United States.

The laboratory that manufactures this technology on behalf of GOVVI is registered with the EPA (Environmental Protection Agency) in the United States.

THE DIFFERENCE BETWEEN COMMERCIAL ENGINE ADDITIVES AND GOVVI TECHNOLOGY

CHEMICAL & ARTIFICIAL COMPONENTS	ENGINE ADDITIVES	GOVVI TECHNOLOGY
Sulfates	YES	NO
Manganese	YES	NO
Lead Tetra-ethyl	YES	NO
Detergents	YES	NO
Organometallic Compounds	NO	YES

Recommendations Regarding the Conditioning Protocol

It is important to mention that during the conditioning protocol (filling the tank four to five times to capacity) the vehicle under test may experience temporary “yields” still below expected performance. Do not be alarmed. This process is normal due to the cleaning phase.

It is recommended to continue with the measurement records up to a minimum of 20 tanks of fuel. You will notice that the savings on the units continue to improve. The GOVVI tablet technology reaches its maximum performance once the product has been used for a distance of 1,000 miles or 1,609 km.

Definitions Cetane (Diesel) And Octane (Gasoline)

WHAT IS CETANE?

Simply put, cetane is a chemical compound found naturally in diesel that ignites easily under pressure. Because of its high flammability, it serves as the industry standard for evaluating fuel combustion quality. Specifically, this measure is referred to as the cetane number.

The higher the cetane number, the more easily the fuel can be ignited. This, of course, translates into a smoother running, better performing engine with more power and fewer harmful emissions. The higher the level of cetane, the better the functionality of the machine. Cetane value also relates to how well the diesel engine starts in cold temperatures.

WHAT IS OCTANE?

Octane is an organic molecule. It is an alkane of eight carbon atoms (C_8H_{18}). It contains several isomers of which the most important is trimethylpentane called isooctane. This is referenced as 100 on the octane scale.

Octane or octane number is a measure of the quality and anti-knock capacity of a gasoline engine. A low octane level is equal to a premature detonation inside the chamber, which results in the piston being hit abruptly causing breakdowns such as rattles or chopping of connection rods.

GOVVI SCIENCE SUPPORT FROM INDUSTRY EXPERTS

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“The tablet is dissolved once placed inside the fuel tank. One part of the gasoline is composed of octane and the other part is composed of Nonane or N-octane. Later (as part of the chemical reaction) the process goes on to branch. Once branched, it causes octane and cetane to increase up to five points. This chemical reaction generates more power, greater efficiency, and less environmental pollution. By increasing the octane, you will obtain 15% to 20% fuel savings, and your engine will work more efficiently avoiding rattling or engine knocking.”

- 1) This technology works under a primary reaction without side effects, meaning it avoids oxidative reactions in the primary reaction system.
- 2) An important environmental benefit is that carbon monoxide is considerably reduced, which helps reduce carbonization on the engine components. As a result the combustion chamber and attached elements, such as spark plugs, exhaust, valves, etc., are not carbonized.
- 3) In a similar chemical reaction, suspended particles such as nitrogen oxides, carbon monoxide, sulfur, nitrous oxides, and thus all the polluting gases, are greatly reduced as a byproduct of the combustion of fossil fuels when this technology is used.

Organometallic Compounds

NOBEL PRIZES AND ORGANOMETALLIC COMPOUNDS

By J. Santiago C.

ABSTRACT

The development of organometallic compounds has played an important role in the development of organic synthesis. This article discusses the works that involved organometallic compounds that received the Nobel Prize in chemistry, compared to other similar works that were not awarded.

INTRODUCTION

The history of the Nobel Prize goes back to 1901, the year in which this award was given for the first time. This prize had been established by the will of Alfred Nobel, 1895, who had amassed an immense fortune from the commercialization of dynamite and other explosives. According to his will, the fortune should be managed by a foundation, which should establish a Prize to recognize exceptional contributions in chemistry, physics, medicine and literature ^[1].

The first Nobel Prize was awarded to Jacobus Van't Hoff "in recognition of his discovery of the laws of chemical dynamics and osmotic pressure in solutions." Curiously the fact that Van't Hoff, even before obtaining his doctorate, had already published in 1874 his first book in French "Chemistry in Space" in which he described his theory of tetravalent and tetrahedral carbon, key concepts in the development of organic chemistry. The reason that the prize was awarded for his latest contributions was perhaps because the theory on the nature of carbon bonds was not widely accepted at the time ^[2].

NOBEL PRIZE IN CHEMISTRY WITH ORGANOMETALLIC COMPOUNDS

Highlighting the contribution of each of the Nobel Prize winners in chemistry would be an arduous task considering the space limitations of this article. Therefore, only those that involve organometallic compounds have been selected.

The 2010 Nobel Prize, which was shared by three scientists, Heck, Negishi and Suzuki, for their work on "Catalyzed Coupling Reactions With Palladium Compounds". The usefulness of their research is to allow the increase of the carbon chains to obtain larger and more complex molecules

[3-5]. These reactions are illustrated in figures 1-3, where an example of the application of these reactions to obtain a more useful compound can also be seen. The difference between the works of Heck, Negishi and Suzuki lies in the different substrates used to bind halogenated aromatics through palladium catalysts.

It should be noted that these reactions that were awarded were not the only ones of their kind. Other coupling reactions are shown in figure 2, but they were not awarded. Among these reactions stand out those of Still, Kumada and Sonogashira [6-10].

OTHER NOBEL PRIZE AND ORGANOMETALLIC COMPOUNDS

The use of palladium compounds in the reactions of the preceding paragraph illustrates the utility of metals and their compounds in organic synthesis. However, the history of organometallic compounds dates back to the 1760s, where the synthesis of organometallic arsenic compounds by Louis Cadet, tetramethyldiarsenine (Figure 3), had already been reported [11].

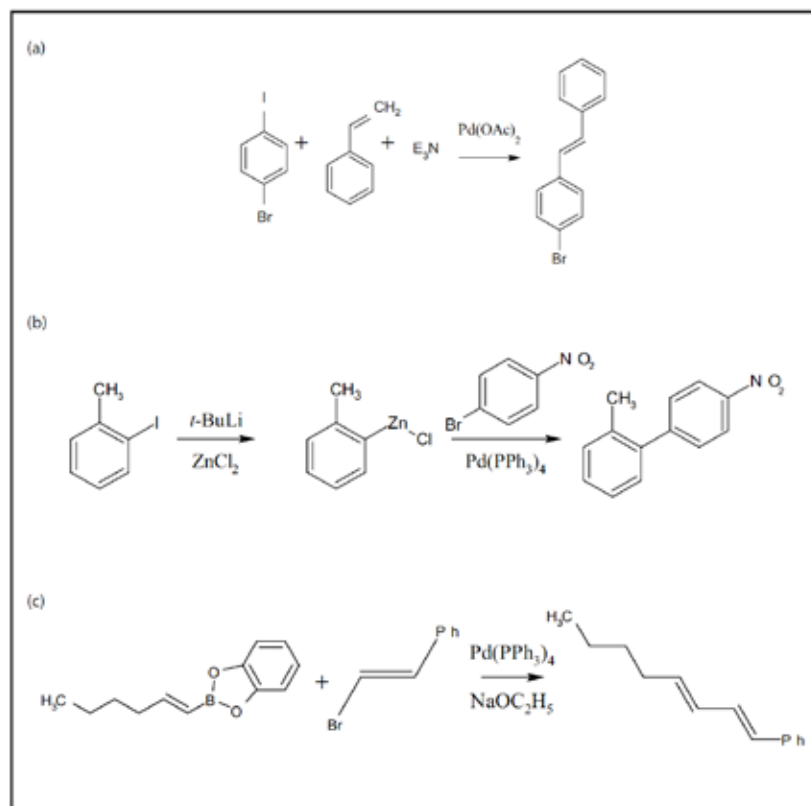


Fig. 1. Examples of application of the reactions of a) Heck, b) Negishi and c) Suzuki.

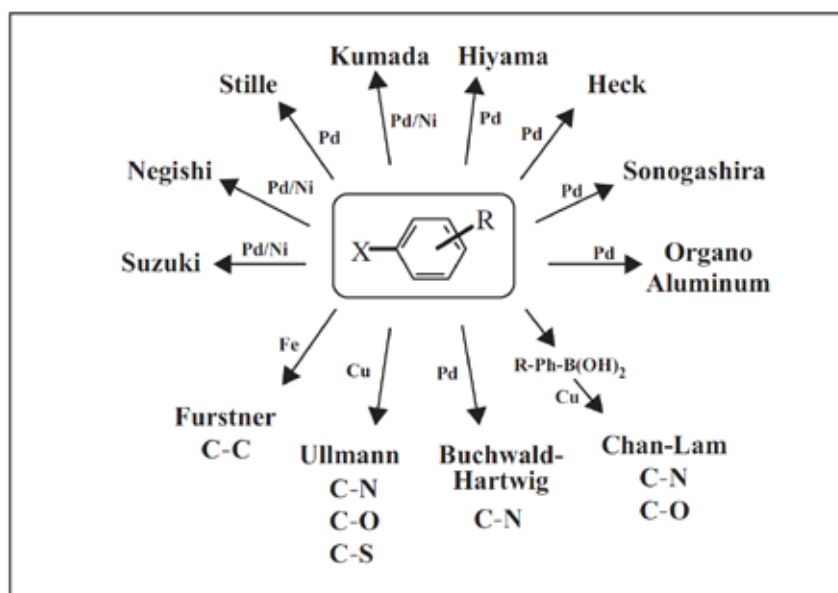


Fig. 2. Other coupling reactions ^[6]

We had to wait until 1912 to see the first Nobel Prize for work with organometallics. Victor Grignard had this honor for obtaining and applying the reagent that bears his name. The interesting thing about this reagent is the radical change of polarity of C bonded to halogen vs. the same C bonded to Mg in the Grignard reagent. That is, it goes from a C with a δ^+ , with low reactivity, to a very reactive carbanion, Figure 4a, so it reacts with a wide variety of electrophiles, as well as with acids, Figure 4b, ^[12-14]. Something similar to the Grignard reagents, although less spectacular, also happens

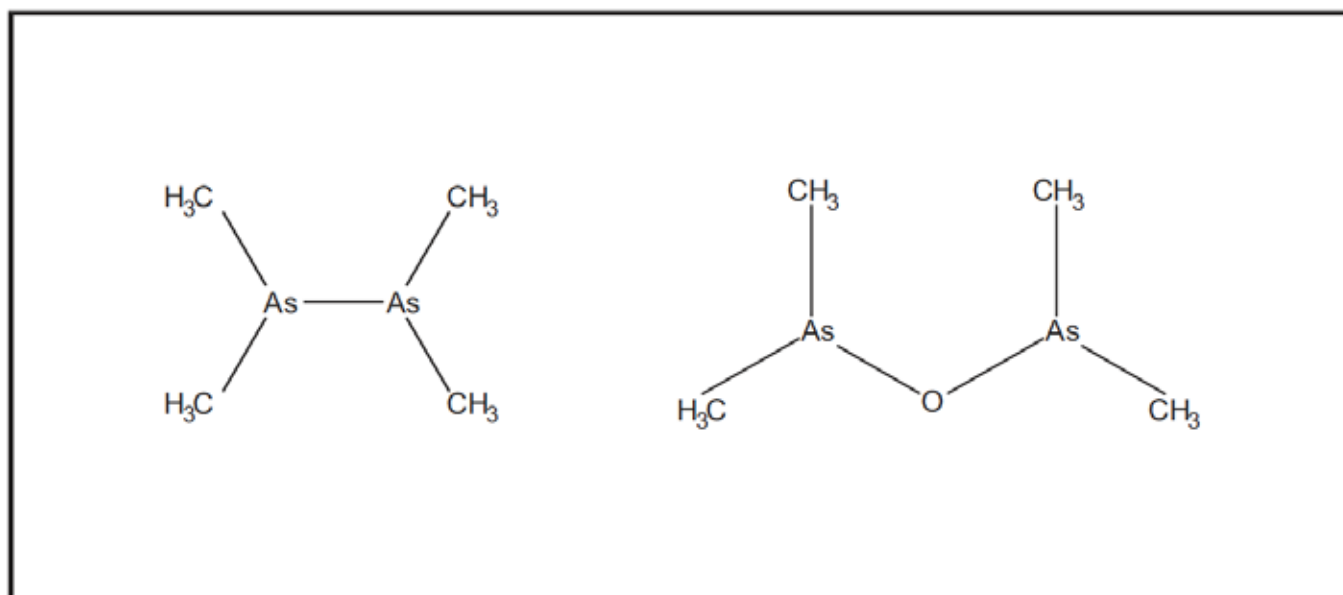


Fig. 3. Organometallic compounds of arsenic prepared by Louis Cadet de Gassicourt.

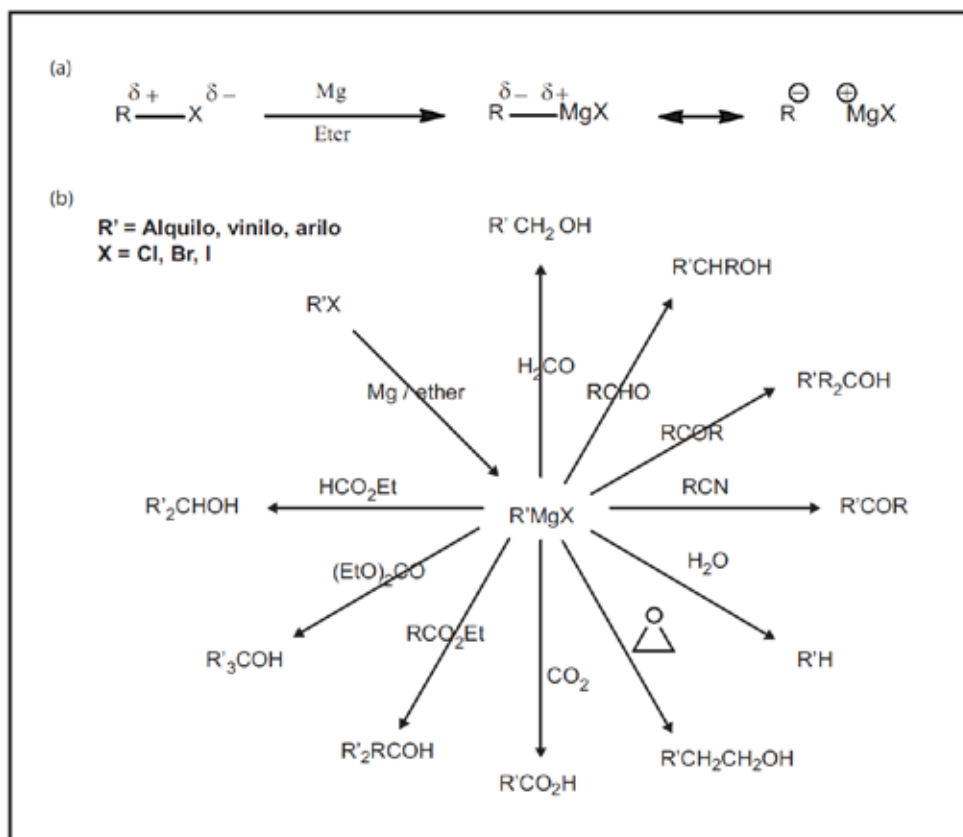


Fig. 4. Some of the typical reactions of Grignard reagents ^[15]

with the Zn analogs. Dimethylzinc, prepared by Frankland in 1849, made it possible to obtain tertiary and secondary alcohols, but these compounds are not easy to obtain and are flammable.

In the Reformatsky reaction, zinc is also used to activate an α -haloester to condense with a carbonyl, Figure 5. According to the reaction mechanism, zinc intercalates between the halogen and the respective carbon, similar to what occurs in the Grignard reagent ^[16].

Another reaction similar to the Grignard reaction is the Barbier reaction, a reaction between an alkyl halide and a carbonyl group in the presence of magnesium, tin, aluminum, zinc, indium, or their salts. The reaction product is a primary, secondary or tertiary alcohol. This reaction is similar to the Grignard reaction, but the fundamental difference is that in the Barbier reaction all the reagents can be mixed from the beginning and even water can be used as a solvent, Figure 6, ^[17,18]. It is interesting to mention that Philippe Barbier was Victor Grignard's teacher.

Organometallic lithium compounds are probably the most popular organometallic compounds today, due to their excellent reactivity as a nucleophile and as a base. Its use in organic chemistry is very versatile, Figure 7, ^[19]. Organometallic lithium compounds have been known since 1917, but since 1930 they have been prepared from metallic lithium and a haloalkane.

The different reactivity of the Grignard reagent and the organolithium is revealed in their reaction with α,β -unsaturated carbonyl compounds, Figure 8. The different reactivity is explained by the theory of Hard and Soft Acids and Bases [21]. Methyl lithium is more reactive and prefers to bind to the "harder" site, the carbonyl carbon (which is also the most electrophilic). On the other hand, the methyl in R_2CuLi or in $RMgX/Cu^{2+}$ is "softer" and binds to the softer electrophilic site, position 4 of the α,β -unsaturated carbonyl compound. In contrast, the methyl of the Grignard reagent has an intermediate "hard" position, so its reaction produces 1.2 and 1.4-addition mixtures.

The reactivity of organometallic lithium compounds can be modulated if the steric hindrance of the alkyl groups attached to lithium is considered, as in the case of lithium diisopropylamide, LDA, in its reaction with carbonyl compounds, Figure 9. Due to steric hindrance, LDA cannot attack the carbonyl; and instead acts as a base to extract an H at α from the carbonyl.

The development of this fascinating lithium organometallic chemistry may well have earned a Nobel Prize.

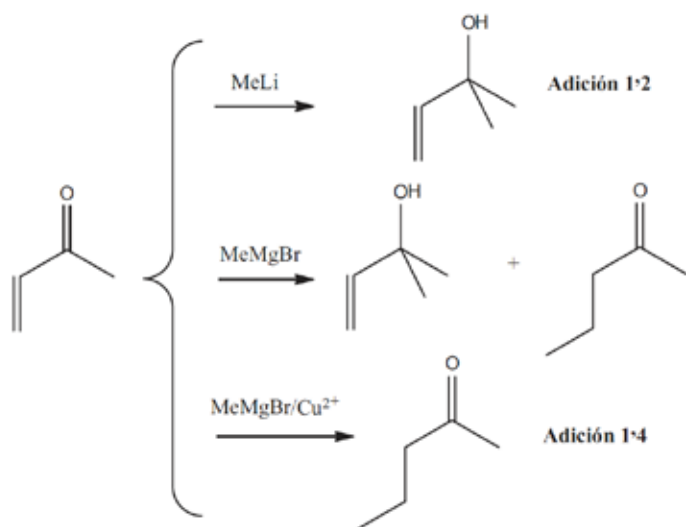


Fig. 8. Reactivity of different organometallic compounds against α,β -unsaturated carbonyl compounds.

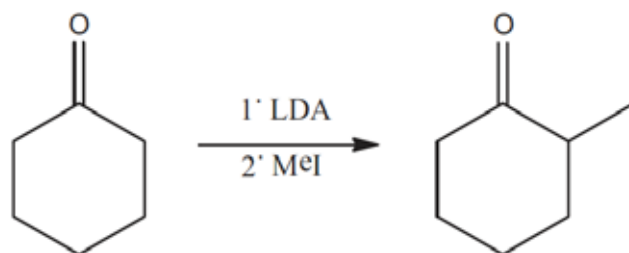


Fig. 9. Reactivity of LDA against carbonyl compounds.

METALLOCENES

In 1974, Otto Fischer and Geoffrey Wilkinson shared the Nobel Prize “for their pioneering work, carried out independently, in the chemistry of organometals, called *Sandwich* compounds”, among which ferrocene is mainly found, Figure 10. However, this compound was synthesized for the first time, albeit accidentally and almost simultaneously, by Kealy and Pauson [22] and by Miller, Tebboth and Tremaine [23], who made a mistake in formulating the compound obtained. It was Woodward and Wilkinson at Harvard University [24], and Fischer at the Technical University of Munich [25] who quickly understood that the properties of this new compound could not be explained by the structures proposed by its discoverers. It was Woodward who named the new compound ferrocene, by analogy with benzene and its extraordinary stability. The interesting thing about ferrocene is that it presented a new type of metal-carbon bond. This compound also presented an unusual type of molecular architecture that could be exploited to design polymerization reaction catalysts, Figure 10, [26]. Likewise, the particular structure of ferrocene plays an important role in the development of the different liquid crystalline phases of the synthesized derivatives, Fig. 11, [27].

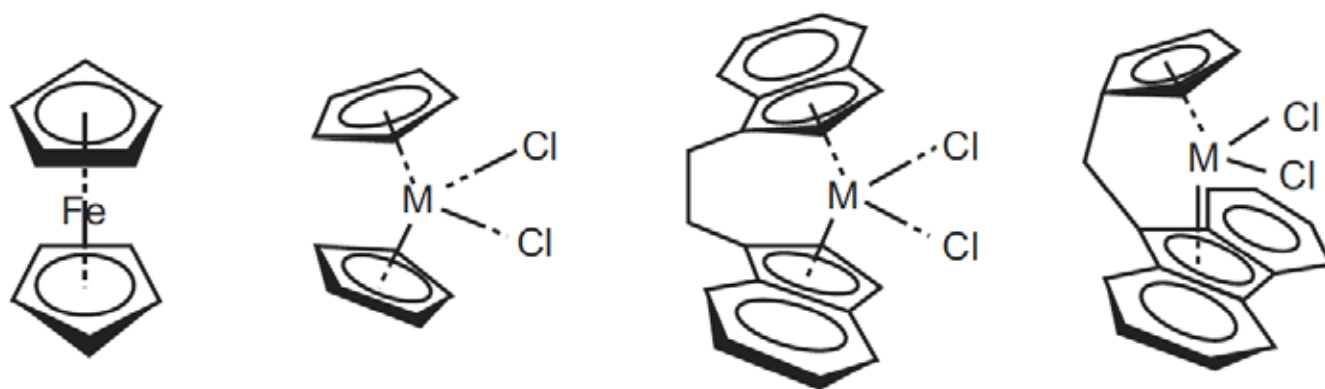


Fig. 10. Structure of ferrocene and other metallocenes used as catalysts in polymerization reactions.

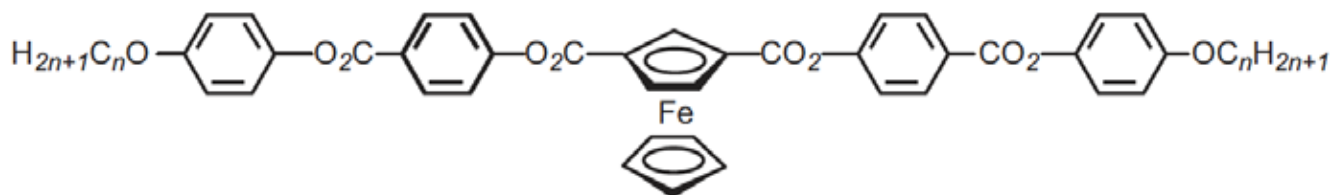


Fig. 11. Structure of a ferrocene derivative with liquid crystal properties.

CONCLUSIONS

The reactions developed by Heck, Negishi, and Suzuki have had a great impact on synthetic organic chemistry. The versatility of these reactions is due to the mild conditions and their tolerance to a wide range of functional groups. The catalysts used allow the activation of the substrates via Pd-C bonds. However, there are other researchers who also developed similar strategies that were not awarded.

Other Nobel Prize winners whose works also showed metal-carbon bonds were Grignard, Fischer and Wilkinson, demonstrating the immense potential application of organometallic compounds in organic synthesis.

BIBLIOGRAPHIC REFERENCES

1. https://en.wikipedia.org/wiki/Nobel_Prize
2. E. Meijer, Jacobus Henricus van't Hoff; Hundred Years of Impact on Stereochemistry in the Netherlands, *Angew. Chem. Int. Ed. Eng.*, 2001, 40(20), 3783–3789.
3. I. Beletskaya, A. Cheprakov, The Heck Reaction as a Sharpening Stone of Palladium Catalysis, *Chem. Rev.*, 2000, 100(8), 3009–3066.
4. J. Casares, P. Espinet, B. Fuentes, G. Salas, Insights into the Mechanism of the Negishi Reaction: ZnRX versus ZnR₂ Reagents, *J. Amer. Chem. Soc.*, 2007, 129(12), 3508–3509.
5. N. Miyaoura, A. Suzuki, Palladium-Catalyzed Cross-Coupling Reactions of Organoboron Compounds, *Chemical Reviews*, 1995, 95(7), 2457–2483.
6. <http://www.nobelcs.com/NCSCHEMISTRY.html>
7. D. Milstein, J. Stille, *J. Am. Chem. Soc.* 1978, 100, 3636.
8. J. Stille, The Palladium-Catalyzed Cross-Coupling Reactions of Organotin Reagents with Organic Electrophiles, *Angew. Chem. Int. Ed. Eng.*, 1986, 25(6), 508–524.
9. K. Tamao, K. Sumitani, M. Kumada, Selective carbon-carbon bond formation by cross-coupling of Grignard reagents with organic halides. Catalysis by nickel-phosphine complexes, *J. Amer. Chem. Soc.*, 1972, 94(12), 4374–4376.
10. K. Sonogashira, Development of Pd–Cu catalyzed cross-coupling of terminal acetylenes with sp²-carbon halides, *J. Organometallic Chem.*, 2002, 653(1–2), 46–49.
11. D. Seyferth, Cadet's Fuming Arsenical Liquid and the Cacodyl Compounds of Bunsen, *Organometallics*, 2001, 20(8), 1488–1498.
12. M. Orchin, The Grignard reagent: Preparation, structure, and some reactions, *J. Chem. Educ.*, 1989, 66(7), 586–
13. E. Ashby, J. Laemmle, H. Neumann, The Mechanisms of Grignard Reagent Addition to Ketones, *Acc. Chem Res.* 1974, 7, 272 - 280.
14. P Knochel, W. Dohle, N. Gommermann, F. Kneisel, F. Kopp, T. Korn, I. Sapountzis, V. Vu, Highly Functionalized Organomagnesium Reagents Prepared through Halogen- Metal Exchange, *Angew. Chem. Int. Ed.*, 2003, 42, 4302-4320.
15. <http://www.chem.ucalgary.ca/courses/351/Carey5th/Ch23/ch23-3-5-1.html>
16. S. Miki, K. Nakamoto, J. Kawakami, S. Handa, S. Nuwa, The First Isolation of Crystalline Ethyl Bromozincacetate, Typical Reformatsky Reagent: Crystal Structure and Convenient Preparation, *Synthesis* 2008 (3), 409–412.
17. A. Jögi, U. Mäeorg, Zn Mediated Regioselective Barbier Reaction of Propargylic Bromides in THF/aq. NH₄Cl Solution, *Molecules*, 2001, 6(12), 964–968.
18. G. Molle, P. Bauer, The Barbier synthesis: a one-slip Grignard reaction?, *J. Am. Chem. Soc.*, 1982, 104(12), 3481–3487.
19. R. Chinchilla, C. Nájera, M. Yus, Functionalized organolithium compounds in total synthesis, *Tetrahedron*, 2005, 61, 3139–3176.
20. http://www.brunswick-ch.com/pdf/downloads/AC_Info_OrganoLithium.pdf
21. R. Pearson, Hard and Soft Acids and Bases, *J. Am. Chem. Soc.*, 1963, 85(22), 3533–3539
22. T. Kealy, P. Pauson, A New Type of Organo-Iron Compound, *Nature*, 1951, 168(4285), 1039.
23. S. Miller, J. Tebboth, J. Tremaine, Dicyclopentadienyliron, *J. Chem. Soc.*, 1952, 632–635.
24. G. Wilkinson, M. Rosenblum, M. C. Whiting, R. Woodward, The Structure of Iron Bis-Cyclopentadienyl, *J. Amer. Chem. Soc.*, 1952, 74(8), 2125–2126.
25. E. Fischer, W. Pfab, Zur Kristallstruktur der Di-Cyclopentadienyl-Verbindungen des zweiwertigen Eisens, Kobalts und Nickels, *Zeitschrift für Naturforschung B*, 1952, 7, 377–379.
26. A. Shafir, J. Arnold, Ferrocene-Based Olefin Polymerization Catalysts: Activation, Structure, and Intermediates, *Organometallics*, 2003, 22(3), 567–575.
27. R. Deschenaux, J. Santiago, D. Guillon, B. Heinrich, 1,3-Disubstituted ferrocene-containing thermotropic liquid crystals of form (η⁵-C₅H₅) Fe[(η⁵-C₅H₃)-1, 3 - (CO₂C₆H₄CO₂C₆H₄OC_nH_{2n+1})₂], *J. Mater. Chem.*, 1994, 4, 679-68

GOVVI

WARNING :: FOR AUTOMOTIVE USE ONLY



USAGE

Each fuel tablet treats 15-20 gallons of gas or diesel fuel.
See optimum results after 2-3 uses.



DIRECTIONS

Insert 1 fuel tablet into fuel tank at every fill up before fueling.



STORAGE

Store away from direct sunlight and heat.

WARNING

Avoid contact with eyes and skin. Do not swallow. **IF IT IS SWALLOWED:**
Do NOT induce vomiting. Contact the Poison Control Center immediately
if swallowed. **KEEP OUT OF REACH OF CHILDREN.**



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