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## Dmf role in acid chloride formation

**Dmf acid chloride. What is the purpose of adding sulfuric acid in the acetal formation reaction. Mechanism of acid chloride formation.**

N,N-Dimethylformamide (DMF) is commonly used as a solvent in laboratory settings and chemical industries due to its effectiveness in facilitating various chemical transformations. However, this article reveals that DMF has far more roles than just being a solvent. In addition to its polar aprotic solvent properties, DMF can also act as a reagent, catalyst, or stabilizer in organic chemistry reactions. This makes it a unique and versatile chemical compound. DMF, A Versatile Polar Solvent in Organic Chemistry DMF (N,N-Dimethylformamide) is an extraordinary compound with the formula (CH3)2NC(O)H, commonly abbreviated. It's a colorless liquid with high boiling point, miscible with water and most organic solvents. Despite its name implying it as a formamide derivative, DMF has multipurpose applications beyond being a solvent. Dimethylformamide (DMF) is an extremely versatile and powerful chemical widely utilized as a solvent in various organic reactions, including colloidal synthesis, block-copolymer preparation, and hydrolysis, among others. Its unique properties also make it an ideal solvent for peptide coupling in the pharmaceutical industry, as well as a key material in manufacturing pesticides, adhesives, synthetic leathers, fibers, films, and surface coatings. DMF's reactivity allows it to be employed as a reagent in important organic reactions, such as the Vilsmeier-Haack reaction, Friedel-Crafts reaction, and Beckmann rearrangement. Its ability to function as either an electrophilic or nucleophilic agent enables it to mediate a wide range of chemical transformations. Furthermore, DMF can participate in various reactions by serving as a multipurpose building block for different functional groups, such as HCO2, O, CO, H, H-, NMe2, CONMe2, Me, CHO, and others. Its structure also allows it to act as a catalyst in the synthesis of acyl halides and cyclic carbonates. In addition to its reactivity and catalytic properties, DMF has been found to stabilize certain metal nanoparticles through interactions with amido groups. It is also commonly used as a solvent in peptide bond formation. However, it is essential to note that DMF can be absorbed through the skin or by inhalation or ingestion, making it a potent chemical that requires careful handling and use. DMF is known for its potential side effects, including constipation, abdominal pain, vomiting, and nausea, as well as headaches, weakness, dizziness, skin issues, and intolerance to alcohol. The solvent properties of DMF were studied by Parker in 1962, while Muzart and colleagues reported on its uses as a ligand, reducing agent, and dehydrating agent in 2009. In addition, recent research has focused on the applications of DMF in nitration, amination, formylation, aminocarbonylation, and amidation. However, this report aims to explore other roles of DMF as a reagent, catalyst, and stabilizer that have not been comprehensively reviewed. DMF is frequently used as an efficient solvent in our laboratory. The report focuses on the applicability of DMF as a reagent, catalyst, and stabilizer. Initial studies involving the Vilsmeier-Haack reagent (POCl3/DMF) led to the formation of malondialdehyde from 2-hydroxy-5-methylacetophenone oxime through Beckmann rearrangement and cyclization. Synthesis of heterocyclic derivatives was achieved by condensing compound 2 with suitable reagents. Another study presented an efficient methodology for preparing formate esters from O-TBDMS/O-TES protected alcohols under Vilsmeier-Haack reaction conditions. A plausible mechanism is proposed, involving the formation of oxonium cations and subsequent elimination of silyl groups to produce imidate salts. The desired formate esters are then obtained through smooth hydrolysis. Research into aldehydes led to a method using acetylides which were converted to lithium acetylides with n-BuLi, then treated with DMF to formulate α-aminoalkoxide, resulting in compound 12 (>94%) as the sole product. This process has several benefits including short reaction times and selective N-formylation. A different approach was developed by Jeon and Yang using DMF as a formylating agent and methyl benzoate as a promoter for N-formylation of primary and secondary amines. A unique method involves cyanation at C-H bonds of heteroaryl compounds using a combined source of "CN" unit. Kim and Chang presented this pathway in 2010, showing that it produces monosubstituted nitriles through regioselective arene C-H cyanation. The reaction uses DMF as a carbon source and NH3 as an N source. The use of N,N-dimethylformamide (DMF) has been explored in various reactions to form different compounds. In cases where an excess of DMF is used, it can prevent the formation of certain reagents and instead produce less reactive adducts. Additionally, the group led by Su synthesized nitriles 52 from intermediates 51. Guan's group discovered a method for preparing tetra-substituted symmetrical pyridines 57 via cyclization of ketoxime carboxylates 56 using DMF as a catalyst. This reaction involves the use of ruthenium under mild conditions, resulting in the formation of one carbon synthon from DMF. Heterocycles containing nitrogen are widely used as pharmaceutical and agrochemical agents due to their antibacterial, antiviral, antitubercular, anticancer, antihistaminic, anti-inflammatory, and antihypertensive properties. As a new metal-free catalytic system, a series of heterocycles including benzothiazoles 59, benzimidazoles 61, quinoxalinone 63, and benzoxazole 65 were synthesized through the cyclization of ortho-substituted aniline derivatives with DMF using BC6F5J3 and CO2. A mechanistic proposal for this reaction involves the activation of DMF by BC6F5J3, followed by nucleophilic attack and intramolecular cyclization to form products. The released dimethylamine reacts with CO2 and silane to produce trimethylamine, which promotes the reaction to completion. In another study, Lei's group reported a simple method for synthesizing terminal olefins including arylvinylketones 67 and arylvinylpyridines 69 through Cu-catalyzed direct oxidative Csp3-H methylenation of arylketones 66 and 1-aryl-1-pyridinemethanes 68, respectively. The mechanism involves the use of DMF as a source of carbon. Lastly, Hajra's group discovered a method for synthesizing heterodiarlylmethanes 73 and 74 through copper-catalyzed coupling reactions of imidazo[1,2-a]pyridines 70 using DMF as a methylenating reagent. Given article text here of 3-(1H-indol-3-ylmethyl)-imidazo[1,2-a]pyridine derivatives were prepared under aerobic reaction conditions. This method is also suitable for preparing 4-imidazo[1,2-a]pyridin-3-ylmethyl(phenyl)dimethylamines. The current methodology presents a new approach to synthesizing important building blocks of heterodiarlylmethanes. A proposed mechanism for this reaction was presented in Scheme 30. Scheme 29 illustrated the synthesis of heterodiarlylmethanes 73 and 74. Scheme 30 presented a possible mechanism for the synthesis of heterodiarlylmethane 73a. Xu's team in 2014 introduced a highly effective protocol for rhodium-catalyzed direct methylation of ketones using DMF, as shown in Scheme 31. Mechanistic studies revealed that DMF plays dual roles: providing carbon for methylation and hydrogen for the rhodium-catalyzed reduction of the methylene into a methyl group. Deuterium labeling experiments were conducted to gain insight into the reaction mechanism. Replacing H2O with D2O did not significantly affect the product yield, but exchanging DMF to d7-DMF resulted in a slower reaction. This suggested that the newly formed methyl group is derived from DMF due to a H/D ratio of 1:2. A probable mechanism was proposed, illustrating in Scheme 33. Persulfate oxidizes DMF to produce an iminium intermediate. The intermediate A is converted to intermediate B and then C-N bond cleavage occurs, creating unsaturated ketone intermediate C. Next, the latter is reduced through a Rh-H complex, probably created from dehydrogenation of DMF by [Cp\*RhCl2]2, leading to the methylated product 75a. Corresponding β-haloformates were generated in high regio- and stereoselectivity by treating alkenes with DMF in the presence of sources of electrophilic halogens, followed by addition of water. A mechanistic scheme for this transformation is shown in Scheme 35. The halonium ion intermediate is converted to an iminium ion by nucleophilic attack of the oxygen of DMF, and then hydrolysis yields the β-haloformate. Chen's team reported a unique method in 2013 for forming complicated imidazolones from carbene complexes via an oxygen-atom insertion reaction using DMF as the source of oxygen. Scheme 36 showed this process. A detailed description of the synthesis pathways for various compounds, including imidazolones, coumarins, α-hydroxy arones, and dihydropyrrrolizino[3,2-b]indol-10-one derivatives, is presented. These syntheses involve the use of dimethylformamide (DMF) as a source of oxygen or nitrogen for the formation of these complex molecules. The mechanistic schemes for the synthesis of imidazolones and coumarins highlight the role of DMF in facilitating the cyclization reactions through nucleophilic attack, leading to the desired products. The transition-metal-free reaction between arynes and N,S-keteneacetals is particularly noteworthy, demonstrating the versatility of DMF as a source of oxygen for complex molecule formation. Additionally, the synthesis of α-hydroxy arones and dihydropyrrrolizino[3,2-b]indol-10-one derivatives showcases the importance of DMF in promoting cascade reactions without the need for exogenous transition metal catalysts or ligands. The electronic effects of substituents on the phenyl ring were found to play a key role in these reactions. Researchers have developed new methods for synthesizing organic compounds. Priya and colleagues found that treating Cu-Fe hydrocalcite-like materials with calcination produced an active oxide catalyst (Scheme 44). Scientists such as Nozaki, Iranpoor, and Liu have explored the amidation of carboxylic acids and aryl halides using N,N-dimethylformamide (DMF). A novel strategy was proposed by Nozaki's group in 2002 for synthesizing arylcarboxamides from aryl halides and DMF without carbon monoxide (Scheme 45). Mechanisms have been suggested for the synthesis of arylcarboxamides, including a Heck-type addition followed by β-hydride elimination or oxidative addition to Pd(0) (Scheme 46). Other mechanisms involve nucleophilic addition to a carbonyl group activated with POCl3 or oxidative addition of the C-H bond in DMF. The reaction between chloropyridine and DMF as an amine source and solvent under refluxing conditions afforded aminopyridines (Scheme 48). Iranpoor's group used WC16/DMF to generate Pd(0) for aminocarbonylation of aryl halides, resulting in the synthesis of N,N-dimethyl amides (Scheme 49). In another study, Liu and colleagues synthesized thioamides from compounds, octasulfur, and dimethylamine prepared in situ from DMF through base-induced cleavage (Scheme 50). Using DMF for Thioamide Reductions According to literature, DMF acts as a reducing agent for various metal ions, including Ag(I) and W(VI), resulting in their conversion to Ag(0) and W(IV), respectively. This reducing property of DMF enables the transformation of Pd(II) into Pd(0). Novel diiridium products have also been generated through the reaction of thioamides with DMF, including the formation of η2-bridging formamido ligands and alkyl (E)-3-(dimethylamino)acrylates. A novel synthetic approach yields alkyl chlorides with a relatively short reaction time. The method involves the addition of alcohols to Vilsmeier-Haack complex, resulting in an interaction between the hydroxyl group and chloromethyliminium species. This is followed by nucleophilic attack of chloride ion, generating the desired alkyl chloride. The proposed mechanism for this reaction is SN2. The Vilsmeier reaction has been used to achieve key transformations, such as formylation. There are reports of annulation of aliphatic substances into their aromatic compounds using POCl3/DMF as the Vilsmeier reagent. A safer alternative to traditional Vilsmeier-Haack reactions is the use of BTC/DMF adduct as a Vilsmeier reagent. This was demonstrated in the synthesis of (Z)-2-chloro-1,3-diarypropen-1-ones from 2,3-epoxy-1,3-diarylpropan-1-ones. The mechanism for this reaction involves the initial formation of halomethylene iminium salts followed by coordination with 2,3-epoxy-1,3-diarylpropan-1-ones to furnish intermediates. Next, intermediates are produced through attack of previously released halide anion on the benzy position. Finally, one molecule of HCl is eliminated to yield the desired products. A convenient method for producing substituted aromatic compounds using BTC/DMF as Vilsmeier reagent was presented by Su and co-workers. This method involved refluxing in dichloromethane for 6 hours. The corresponding nitro derivatives can be generated via nitration of aromatic compounds and cinnamic acids with (COCl)2/DMF using KNO3 or NaNO2 under microwave and ultrasonic conditions, respectively. Microwave and ultrasonic irradiation have been shown to enhance product yield and reduce reaction time in various chemical transformations. This methodology presents several advantages, including a simple work-up procedure, the use of readily available and economical reagents, excellent yields, and short reaction times. A new protocol for converting ketoximes to amides has been developed using a mild, efficient, and general method involving a Beckmann rearrangement with an inexpensive and nontoxic reagent. Additionally, protocols for synthesizing azlactone derivatives and benzimidazoles have been reported, showcasing the potential of microwave-assisted reactions in organic synthesis. A novel one-pot synthesis of benzimidazoles has been reported by Liu and co-workers using PHSiH3 as the sole promoter under metal-free conditions. The synthesis utilizes 2-phenylenediamines and DMF, producing heterocycles 137 with high efficiency. DMF also serves as a catalyst in various reactions, including the Beckmann rearrangement of imidolizines and the synthesis of benzylidene acetals of mono- and disaccharides. In another reported method, Jarrahpour and co-workers utilize alkoxymethylene-N,N-dimethyliminium salts to form 2-acetimidones. DMF's catalytic properties have been demonstrated in several reactions, including the formation of 1-amino-2-acetylthranquinone. The reaction involves the reductive ring-cleavage of an isoxazole motif-containing compound, with DMF serving as both catalyst and reaction medium. Furthermore, Singh and co-workers have developed a mild protocol for regioselective synthesis of azepine 146a and 1,4-diazepine 146b through Beckmann rearrangement of ketoximes of pyrazolo annulated oxocarbazole 145a and oxazacarbazole 145b. The reaction is facilitated by an organocatalyst derived from DMF and TCTA. Lastly, Sun and co-workers have prepared cyclic carbonate 148 through cycloaddition of propylene oxide 147 with CO2 catalyzed by ZnBr2/DMF. DMF as a co-catalyst and activator/solvent for CO2 in gas and liquid phases A novel catalyst using DMF was applied to produce propylene carbonate with high yield and selectivity. The catalytic cycle begins through coordination of PO with ZnBr2, followed by attack of the carboxylate anion from DMF on the less hindered carbon atom of PO. The subsequent steps include cyclic elimination in an intermolecular fashion, resulting in the formation of propylene carbonate 148. DMF was utilized as a catalyst and solvent in various organic reactions, including the conversion of carboxylate anions to PO. This led to the generation of propylene carbonate via intramolecular nucleophilic attack and ring-closure reaction. Additionally, DMF was used to produce 1,2-diols from epoxides through hydrolysis. In another process, epoxide treatment with DMF resulted in the formation of N,N-dimethylformamide ethylene acetal derivative, which was then opened by H2O to yield vicinal diol and regenerated DMF. A monohalogenation method using SOCl2 and catalytic amounts of DMF produced 4-chloro-3-oxypyrazoles with high regioselectivity. Nitriles were synthesized through dehydration of aldoximes by employing DMF as catalyst and solvent, while a novel pathway to synthesize 1,2-disubstituted (E)-vinyl bromides was achieved via DMF-induced reaction of (Z)-1-bromo-1-alkenylidialkylboranes with N-haloogeno compounds. The construction of a halonium ion across the CC bond is thought to be followed by the migration of an alkyl group from the dialkylboryl group to the alpha-carbon atom, resulting in intermediate A. This intermediate then undergoes trans-elimination to produce 2-disubstituted (E)-vinyl bromides 167. The synthesis of N-Boc and N-Chz homoallylic amines was achieved by Wu and Sun through allylation of various imines with allyltrichlorosilanes using DMF as an activator and solvent, yielding a syn/anti mixture of the desired product (Scheme 85). Additionally, the crotylation of aldimine 170 with (E)-crotyltrichlorosilanes under similar conditions yielded the same product in good yields (syn/anti ratio) (Scheme 86). Furthermore, Temouri and Tayyebi synthesized 5-(alkyl or arylamino)methylenebarbituric acids 174 through DMF-promoted condensation reactions of alkylisocyanides with barbituric acid derivatives, showcasing six advantages over other methods (Scheme 87). Synthesis of syn- and anti-homoallylic alcohols was achieved by treating aldehydes with allyltrichlorosilanes in DMF without a catalyst, forming novel C-C bonds only at β-positions (Scheme 88). The transition state is suggested to be a six-membered molecule. In other reactions, the smooth conversion of β-aminoalcohols to β-amino bromides was accomplished using DMF and thionyl bromide by Jung and co-workers in 2000. This method also applies to the conversion of primary and secondary alcohols to their corresponding bromides in high yields (example given). DMF proved to be an excellent catalyst in bromide synthesis, yielding 181 with high purity (89%) and efficiency (Scheme 90). When used alongside cyclohexane, it significantly accelerated the reaction through a Vilsmeier-Haack type SOBr2-DMF complex. Jung's group experimented with various solvents to optimize conditions for this method, finding that cyclohexane produced the best results. In separate studies, DMF was employed as a catalyst in Friedel-Crafts reactions, such as the synthesis of N,N-dibenzylamino ethanol 181 (Scheme 90). Poupaert and co-workers used I2/DMF to catalyze the acylation of aromatic compounds, including anisole 185, for the production of aryl ketones. This reaction minimized energy consumption and waste generation, producing a catalyst and waste that were harmless to the environment (Schemes 91). Furthermore, DMF formed a stable complex with iodine when reacting with oxygen atoms, resulting in a unique I2/DMF catalyst. This showed exceptional behavior in the Friedel-Crafts acylation of aromatic compounds containing electron-donating groups (Scheme 91). The same group then used a DMF-based ionic liquid as both a nucleophilic reagent and solvent to synthesize 1,2-disubstituted-3,4-dihydronaphthalenes 191 through cycloaddition with various vinylarenes 189 and electron-deficient alkynes 190 (Scheme 92). Two mechanisms were proposed for this reaction: the first involved nucleophilic attack by DMF's oxygen on vinylic carbon to form intermediate A, followed by aromatization; the second involved nucleophilic attack on acetylenic carbon of acetylene dicarboxylate 190, leading to product C through various intermediates (Scheme 93). Additionally, DMF was used as a stabilizer in the solution preparation of metal nanoclusters and nanoparticles. This method utilized DMF as a solvent, reagent, and stabilizer for the synthesis of Pt, Au, Cu, and Pd metal NCs and NPs without the need for surfactants (Scheme 94). DMF-stabilized metal nanoclusters have shown excellent catalytic activity in various organic reactions, including methylation and cross-coupling reactions. Obara and co-workers successfully applied DMF-stabilized Ir nanoclusters as catalysts for the methylation of alcohols and anilines using MeOH as a source of C1 (Scheme 94). Kawasaki and co-workers investigated the catalytic effect of DMF-stabilized AuNCs in reducing 4-nitrophenol to 4-aminophenol, proposing a mechanism involving two steps: regeneration of DMF layers on the surface of Au NCs and penetration of PNP into the active surface (Fig. 2). Lang and co-workers prepared DMF-stabilized gold nanoparticles by controlling reaction time and temperature, finding that 2.5 nm Au NPs exhibited high catalytic activity for Ullmann homocoupling reactions. The catalyst can also be used in Sonogashira cross-coupling reactions with various substrates (Scheme 96). Additionally, the Migita-Kosugi-Stille cross-coupling reaction has been applied to synthesize biaryl compounds using palladium nanoclusters stabilized by N,N-dimethylformamide (Scheme 97). Pd NCs have been identified as a highly effective catalyst in the synthesis of biaryl (vinylarene) 204 using the NMP/DMF mixture. The addition of copper iodide has been shown to enhance the efficiency of the Migita-Kosugi-Stille reaction, yielding product 204 in excellent yield. A novel DMF reduction method has also been developed to produce monodisperse Fe2O3 NPs (2-5 nm) as a catalyst, which exhibits efficient catalytic activity in hydroxylation reactions without the need for additives. DMF has emerged as a versatile compound with multiple applications, including its use as an effective polar solvent and reagent in various reactions such as formylation, amination, aminocarbonylation, amidation, and nitration. Recent developments in the employment of DMF as a precursor in these reactions have seen significant progress. The potential for further innovation and development of new catalytic systems is expected to drive the practical utilization of DMF as a catalyst, with important consequences for green and sustainable chemistry. The references provided are a list of research papers that discuss various aspects of chemistry, particularly in the areas of organic synthesis, catalysis, and materials science. Some of the papers deal with the formation of formamides, which are a type of compound that can be used as solvents or precursors for other chemical reactions. Other papers describe the use of organolithium compounds, which are highly reactive molecules that can be used to synthesize complex organic molecules. There are also references to papers that discuss the properties and applications of acyl halides, which are a type of compound that can be used as intermediates in organic synthesis. Additionally, some papers describe the use of carbon dioxide (CO2) as a reactant or solvent in chemical reactions, with potential applications in fields such as materials science and catalysis. Overall, the references provided cover a range of topics in chemistry, from synthetic methods and applications, and demonstrate the importance of these compounds and reactions in various scientific disciplines. A series of studies on the synthesis of organometallic compounds were conducted by various researchers from 1993 to 2018. The first study was published in Tetrahedron Lett. in 1993 and described the synthesis of certain organic compounds. Subsequent studies, including those published in Synth. Commun., Tetrahedron Lett., Langmuir, Chem. Commun., J. Phys. Chem. C and Dalton Trans., further explored the synthesis of these compounds using different methods and conditions. The researchers involved in these studies included R. Hua, S. Kobayashi, K. Nishio, A. S. Nagle, R. N. Salvatore, B.-D. Chong, K. W. Jung, F. Guenadi, H. Aichaoui, D. Lambert, C. R. McCurdy, J. Poupaert, X. Liu, C. Li, J. Xu, J. Lv, M. Zhu, Y. Guo, S. Cui, H. Liu, and S. Wang. The studies were published in a range of journals, including Tetrahedron Lett., Langmuir, Chem. Commun., Dalton Trans., and RSC Adv. The researchers used various techniques, such as chemical reactions and physical methods, to synthesize the compounds and study their properties. Some of the key findings from these studies include the development of new synthetic methods for organometallic compounds and the characterization of their physical and chemical properties. Several studies have investigated various aspects of organic chemistry related to functional group transformations and reactions. Researchers such as Chen et al., Rappoport, Laroek, Miller, and others have published papers on topics like cyanation, arylation, and other functional group modifications. The work of Pawar, Chang, and Beller has also been highlighted in journals like Tetrahedron Letters and Chemistry of the Cyano Group. Other researchers such as Kim, Shin, and Grushin have made significant contributions to the understanding of chemical reactions and transformations. Additionally, studies by Zhang et al., Wen et al., and Ding have explored new methods for functional group synthesis and modification. The work of Liu, Wang, and Beltramini has also been published in prominent journals like Chemistry Communications and Catalysis Science and Technology. Overall, these research efforts demonstrate the ongoing interest and investigation into various aspects of organic chemistry, particularly in the areas of functional group transformations and reactions. Researchers have published numerous studies on various topics in chemistry journals between 2002 and 2018. Some specific research papers were mentioned, including those from Chem. Rev., Chem. Commun., RSC Adv., J. Am. Chem. Soc., and Org. Lett. In these studies, authors discussed various methods and results related to organic synthesis, catalysis, and chemical reactions. Specific articles focused on topics such as carbon-carbon bond formation, oxidation reactions, and the use of transition metal catalysts. Researchers also reported on their findings regarding the application of certain compounds in specific fields, including materials science and pharmaceutical chemistry. The publication dates of these studies range from 2002 to 2018, indicating that the research was conducted over a period of several years. A comprehensive review of literature has been compiled on the synthesis and properties of various heterocyclic compounds. Research papers from numerous authors have been cited, including studies published in journals such as Tetrahedron Letters, Synthesis, and the Journal of Organic Chemistry. The research covers various aspects of heterocycle synthesis, including the use of Vilsmeier reagents, the reaction of 2-aminopyrimidine with DMF, and the synthesis of pyridines from aromatic amines. Authors such as A.R. Katritzky, C.M. Marson, and M.S. Kumar have made significant contributions to this area. The review also highlights the importance of metal-catalyzed reactions in heterocycle synthesis, with studies by authors such as J. Zhu and W.-C. Li demonstrating the potential of these methods. Additionally, the review touches on the use of zeolites and other solid catalysts in the synthesis of heterocycles. The literature review covers a broad range of topics, including the properties and reactivity of various heterocyclic compounds, as well as their applications in fields such as chemistry and biology. Note: I've tried to preserve the essence of the original text while paraphrasing it. However, please let me know if you'd like me to make any specific changes or clarify any points. The Stille reaction is a widely used coupling reaction in organic synthesis. It involves the cross-coupling of an organostannane with an aryl halide to form a new C-C bond. The reaction requires a palladium catalyst and can be used to synthesize a wide range of compounds. Several research papers have reported on the application of the Stille reaction in various fields, including catalysis (Bhanage et al., 2001; Yasuda et al., 2002), organic synthesis (Hosomi et al., 1987; Yavari et al., 2001), and pharmaceuticals (Aly et al., 2004). The Stille reaction has been optimized in terms of catalyst, solvent, and conditions to improve its efficiency and selectivity. For example, the use of more active palladium catalysts (Bringmann et al., 2001) and the employment of alternative solvents (Pereyre et al., 1987) have been reported. The Stille reaction has also been used as a key step in the synthesis of complex molecules, such as natural products (Hullo et al., 2017). Additionally, it has been employed in the development of new methodologies and reagents for organic synthesis (Espinet et al., 2004; Bringmann et al., 2001). The literature search reveals a significant number of research papers related to the Stille reaction, highlighting its importance and versatility in organic chemistry. This text refers to a couple of scientific articles published in the years 2014 and 2018. In the first article, RSC.M., M. Heravi, E. Hashemi, and F. Azimian wrote about their research findings from 2014, which were published in Tetrahedron journal, pages 7-21. Meanwhile, another article by M. Heravi and L. Mohammadhani was released in the Journal of Organometallic Chemistry, specifically on pages 106-200 in 2018.