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The Synthesis of Schiff bases under microwave Irradiation: Review

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ABSTRACT

Microwave-assisted organic synthesis (MAOS) is the study of chemical reactions under the effect of microwave radiation. Microwaves radiation have high energy electric fields and will generally heat any substance containing mobile electric charges, such as polar molecules in a solvent or conducting ions in a solid. In resent year the synthesis of Schiff bases under influence of microwave irradiation was found much easier and faster than conventional heating. The synthesis in Microwave irradiation in solvent free or lower solvent conditions are good method for reduce the pollution, lowering the cost and increase the product together with simplicity in processing and handling.

KEY WORDS: Microwave, Schiff base, Green chemistry.

1. INTRODECTION

Microwave-assisted synthesis is green chemical method, the application of microwave-assisted is useful technology in organic synthesis because it is simple, sensitive, reducing the hazard, often possible to reduce reaction times to a few minutes under solvent free or lower solvent and increase the yields and easier work up as compared to conventional methods. In Schiff bases the carbon-nitrogen double bond (azomethine group) plays important role in synthetic reaction in organic chemistry and which imports in elucidating the mechanism of rasemination and transamination reactions in biological system. Schiff bases are synthesized by condensation of primary amines with compounds containing carbonyl groups which involves the use of organic solvents such as methanol, tetrahydrofuran (THF), and 1,2-dichloroethane (DCE). Schiff bases are important intermediates for the synthesis of compounds in medicine and pharmaceutics. Schiff base play a vital role in biological activities such as antibacterial, antifungal and antitumor activity. Schiff base compounds are very common ligands because of their easy formation and rich coordination chemistry with a large variety of metal ions that has allowed their use as catalysts in different asymmetric reactions.

General procedures for the synthesis of Schiff bases:

- A mixture of Substituted aniline (1mmol), Aromatic aldehyde or ketone (1mmol), neutral alumina (1g) and dichloromethane (2ml) in conical flask was inputted into microwave oven and irradiated for 4 min (output power at 20%). After cooling, the product was recrystallized.
- A mixture of anilines and substituted aldehyde was putted in beaker and mixed well. In a microwave oven the mixture was irradiated at 160 W for the several min. The end of reaction was monitored by (TLC). After completion of the reaction, the mixture was poured into cold water. The crystal obtained was filtered, washed, dried and recrystallized.
- Schiff base was synthesized by ethanoic mixture of aldehyde (0.1mol) and aromatic amines (0.1mol) were placed in a conical flask and irradiated by use microwave oven at 800 W. after completion of reaction that it was monitored by TLC the reaction mixture was allowed to attain RT. The solid mass obtained and recrystallized.
- A homogeneous mixture of amine (0.01mol), substituted Benzaldehyde (0.01mol), acetic acid (0.2 ml) in ethanol (10 ml), was put in a microwave reaction vessel equipped with a magnetic stirrer . The vessel was closed and the reaction was irradiated at 50 W for 30 sec. interval for 3 min. washed the solid in water and purified by recrystallization.
- A mixture of amine (0.01mol) and aldehyde (0.01mol) was irradiated in a microwave oven at 10 % intensity for 2-3 min. (four to six pulses each of 30 sec.) and the reaction mixture allow to cool. The crystal was filtered, washed by methanol and dried in oven. When solid aldehyde was used, the mixture of amine (0.01mol), aldehyde (0.01mol) and alumina (1.0g, mesh: 70-290 ASTM, PH= 4.5) were finely ground in mortar and pestle then, the mixture was irradiated in microwave oven at 10 % intensity for 2-3 min. (four to six pulses each of 30 sec.) and keep it to cool. The resultant solid mixture was poured into 30 mL of methanol, and then solid separated was filtered, washed with methanol.
- Aldehyde (0.001mol) and aniline (0.001mol) in (5 mL) water were mixed in a (50 mL) borosilicate glass beaker, the reaction mixture was irradiated in microwave oven for several minutes at an output of 300 watts power, with short interruptions of 15 second. The progress of reaction was detected by TLC. After completion of the reaction, the solid was separated by filtration. The product was purified by recrystallization process.
- Dissolve amine (0.01mol) in 12 ml of methanol as a solvent in beaker. Now add (0.01mol) of aldehyde to it.

Keep the mixture under microwave irradiation for several minutes at medium low temperature. After completing the reaction immediately put it in cold water bath having temperature less than 15oC. When the crystals will appear. Add (10 ml) methanol and dissolved the product in it and re-crystallize the product.

- Amine (0.01mol), aryl/hetero aldehyde (0.01mol) and amount of glacial acetic acid as catalyst were mixed with DMSO (2 mL) in a beaker and then the reaction mixture was put in microwave oven at an interval of (1 min) at 180 W for about (1-2 min), progress of the reaction was monitored by TLC. After the completion of the reaction, the mixture was poured into cold water, stirred well and the solid product was filtered, washed with excess of methanol and then dried at RT.
- Amine (0.1mol), acetic acid (2 mL), and carbonyl compound (0.1mol) were mixed thoroughly in a sealed vessel. The vessel was then placed in a microwave oven and the mixture was irradiated at 300 W for 4–8 min. The progress reaction was monitored by TLC until it was complete. The acetic acid was then removed by reduced-pressure distillation. Ethanol (10 mL) was added to the residue. The solid formed was separate by filtration. After recrystallization the product.
- A mixture of aldehyde (0.01mol) and amine (0.01mol) was taken in a 100 mL Borosil beaker. This beaker was zapped into the microwave oven and subjected to microwave irradiation for 2 min. The completion of the reaction was checked by TLC. The reaction mixture was allow to be cool and poured into ice-cold water. The solid was filtered and recrystallized.
- A mixture of amine (0.01mol) and aldehyde (0.01mol) and (3g) silica gel was mixed in mortar to get the soft powder mixture, and then irradiated at 300W for several minute. The complete of the reaction was monitored by TLC. After complete the reaction, a solid product was washed with alcohol and after the concentration of the solution, the precipitate was obtained and washed with alcohol, dried and purified by recrystallization process.
- A reaction mixture of (0.01mol) of amine in water, (0.01mol) of the aldehyde and (2 drops) of concentrated sulphuric acid was kept inside a microwave oven operating at (160 W) for ten minutes. After completion of the reaction, the mixture was poured into water and then allowed to cool to RT. The resulting solid was recrystallized. The progress of the reaction was monitored by TLC after every 3 minutes. TLC showed complete conversion after several minutes.

2. CONCLUSION

This work is a review in Conventional methods for the Synthesis of Schiff bases under microwave irradiation as heat source .These methods are useful tools for reduce reaction times and improved yields.

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