Aqueous Knoevenagel Condensation of Aromatic Aldehydes with Malononitrile Using Molybdenum Oxide Wires

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Background: Organic reactions under aqueous conditions have increasingly attracted chemists' interests, particularly from the viewpoint of green chemistry. As an important carbon-carbon bond forming reaction, Knoevenagel condensation has been extensively studied that discovered by E. Knoevenagel in 1896 [2]. This reaction has been used for the preparation of a wide range of substituted electrophilic alkenes and for the synthesis of intermediate [3]. As a result of their importance a large number of methods for the Knoevenagel condensation have been reported [4]. But it is noteworthy to observe that all these protocols have some drawbacks, such as use of expensive catalyst, high temperature, long reaction time, disposal of toxic solvents and catalyst. Therefore, many efforts have been made to introduce new methodologies that are more efficient, economical, and compatible with the environment.

Methods: The catalyst was prepared through wet chemical method. A flask containing a mixture of the aldehyde and malononitrile was vigorously stirred at temperature (60 ˚C). Workup included filtration, extraction and evaporation. Products were subsequently purified by recrystallisation and were identified by TLC and NMR.

Results: In this aqueous system in relatively short time yield of the products were up to 95%. The temperature of reaction was 60℃ and no extra base or acid was used. The catalyst was removed by simple filtration from reaction. TEM and SEM images of the as-obtained catalyst showed that The wire like products possess the uniform 1D morphology of 80–120 nm in width and several micrometers in length. The crystalline structure of nanowires was confirmed as monoclinic phase by XRD. The percent of molybdenum in structures was estimated 44.4216%.

Conclusion: Herein we report our study on the Knoevenagel condensations benzaldehydes with malononitrile in aqueous conditions with very good yields in the presence of molybdenum oxide wires as efficient, cheap and reusable catalyst for Knoevenagel condensation. The synthesis of catalyst was scale up and the yield of product was high.

Keywords: Knoevenagel Condensation; Molybdenum Oxide; Catalyst; Aldehydes.

References

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