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Ultrasonic irradiation as an energy source to catalyze the formation of a new bioactive sulfonylphthalimide

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INTRODUCTION & AIM

The use of ultrasonic irradiation as an energy source to catalyze the formation of new biomolecules represents an innovative approach in the field of organic synthesis and green chemistry. This method harnesses ultrasonic waves, high-frequency sound waves, to induce chemical reactions efficiently and rapidly [1].

In the specific case of forming a bioactive sulfonylphthalimide, using ultrasonic irradiation offers several advantages. Firstly, it reduces the reaction times required to obtain the desired product, contributing to an overall increase in synthesis efficiency. Additionally, the intensity of ultrasonic waves can be adjusted to selectively control the formation of specific products and minimize the generation of undesirable by-products. Furthermore, this technique can often be performed at room temperature or slightly elevated temperatures, avoiding the need for more energy-intensive reaction conditions.

METHOD

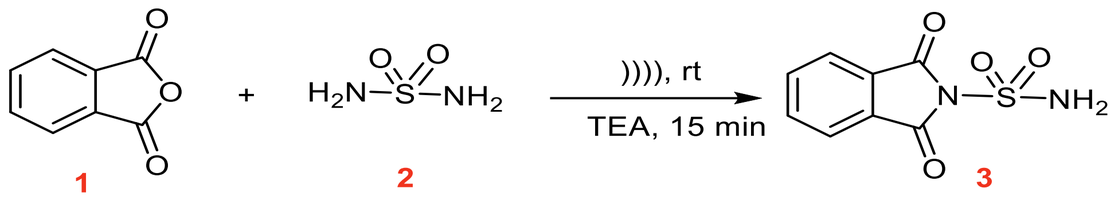
In a glass tube (volume: 20 mL) a mixture of phthalic anhydride **1** (1 mmol) and sulfonamide **2** (1 mmol) was taken at room temperature in the presence of triethylamine.
The reaction mixture was then sonicated by an ultrasonic bath at a frequency of 40 kHz during a time 15 min. After completion of the reaction, the mixture was purified by column chromatography over silica gel using a dichloromethane and ethanol (99/1) as eluent.

RESULTS & DISCUSSION

The development of new clean and efficient processes for the preparation of new compounds is currently an important research area in organic chemistry. Thus, the ultrasonic irradiation has been established as an important technique in organic synthesis [2-3].

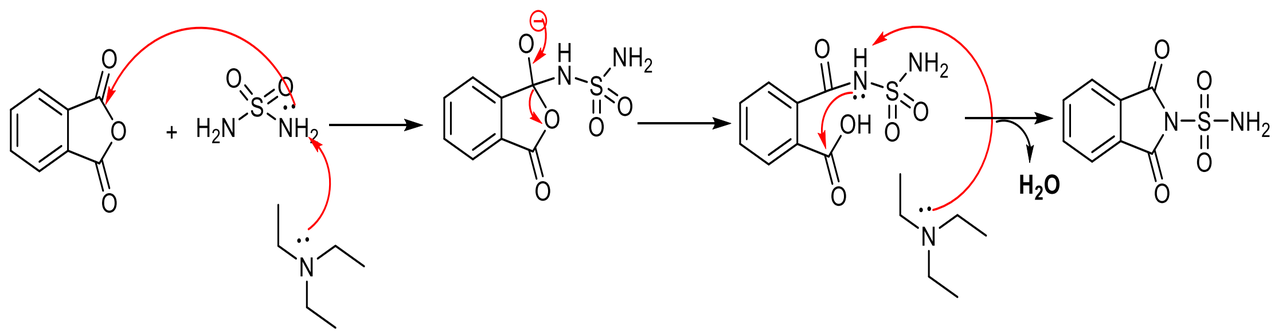
We herein describe the ultrasound promoted procedure for the synthesis of sulfonylphtalimide **3** by the sulfonamide **2** with phthalic anhydride **1**, in the presence of triethylamine (Scheme 1). The rapid kinetics under mild conditions, simple work-up and easy purification are added advantages of this protocol.

We also used ultrasound to perform the same reaction with solvent removal and temperature reduction. Under these conditions, we found that ultrasound irradiation causes a strong acceleration of this process (reaction time was shorten) to give the sulfonylphthalimide in 87% yield, at 15 min.



Scheme 1. Synthesis of new sulfonylphtalimide.

The possible reaction mechanism for the synthesis of sulfonylphthalimide is presented in (Scheme 2).



Scheme 1. Mechanistic proposal for the synthesis of new sulfonylphthalimide.

The supplemental materials contain characterization of the new synthesized products with 1HNMR, 13CNMR, and Infrared spectra.

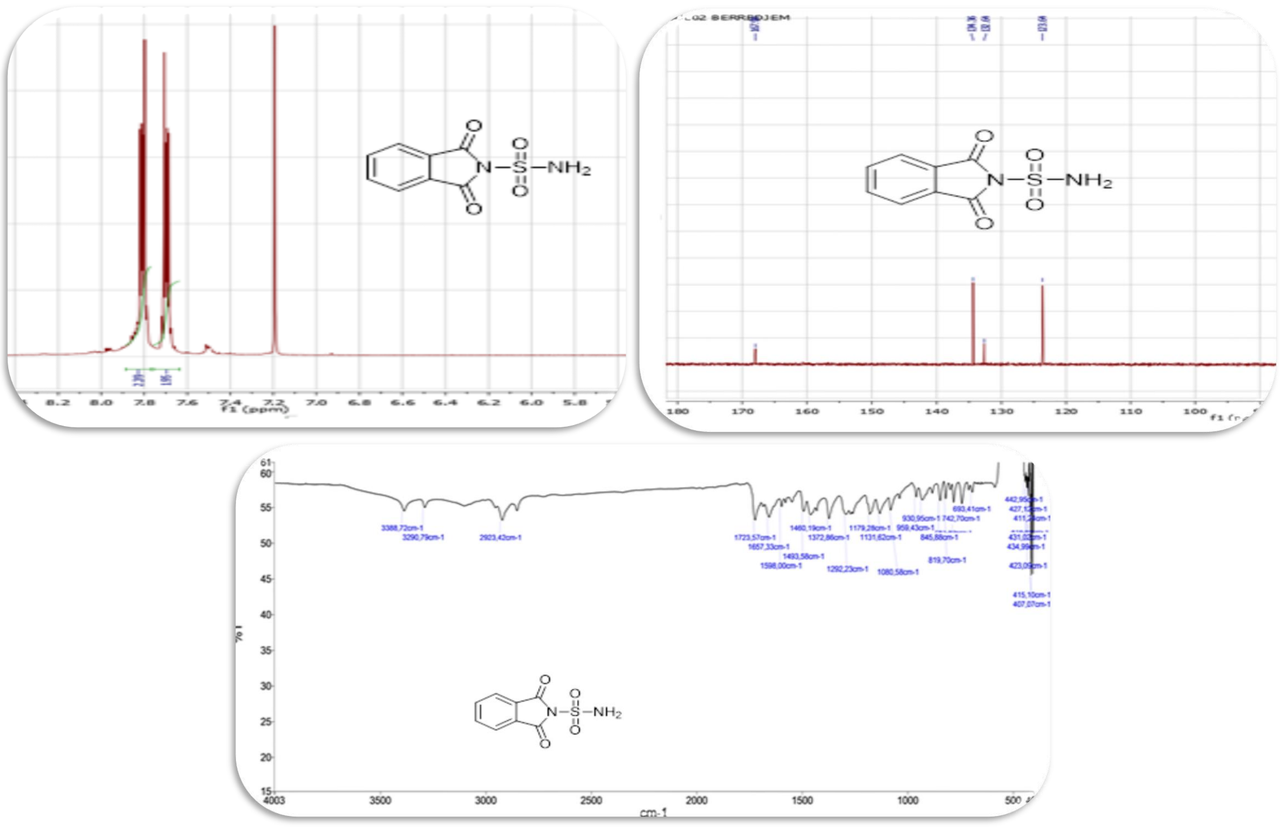


Figure. Spectrum 1HRMN, 13CRMN and IR of new sulfonylphthalimide

CONCLUSION

In summary, ultrasonic irradiation provides an effective and sustainable approach for catalyzing the formation of bioactive sulfonylphthalimides, paving the way for new advancements in the synthesis of pharmaceutical and biologically relevant chemical compounds.

FUTURE WORK / REFERENCES

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