



Aqueous Microwave Assisted Novel Synthesis of Isothiocyanates by Amine Catalysed Thionation of Isocyanides with Lawesson's Reagent



Sodeeq-Aderotimi Salami, Vincent J. Smith, Rui W.M. Krause.

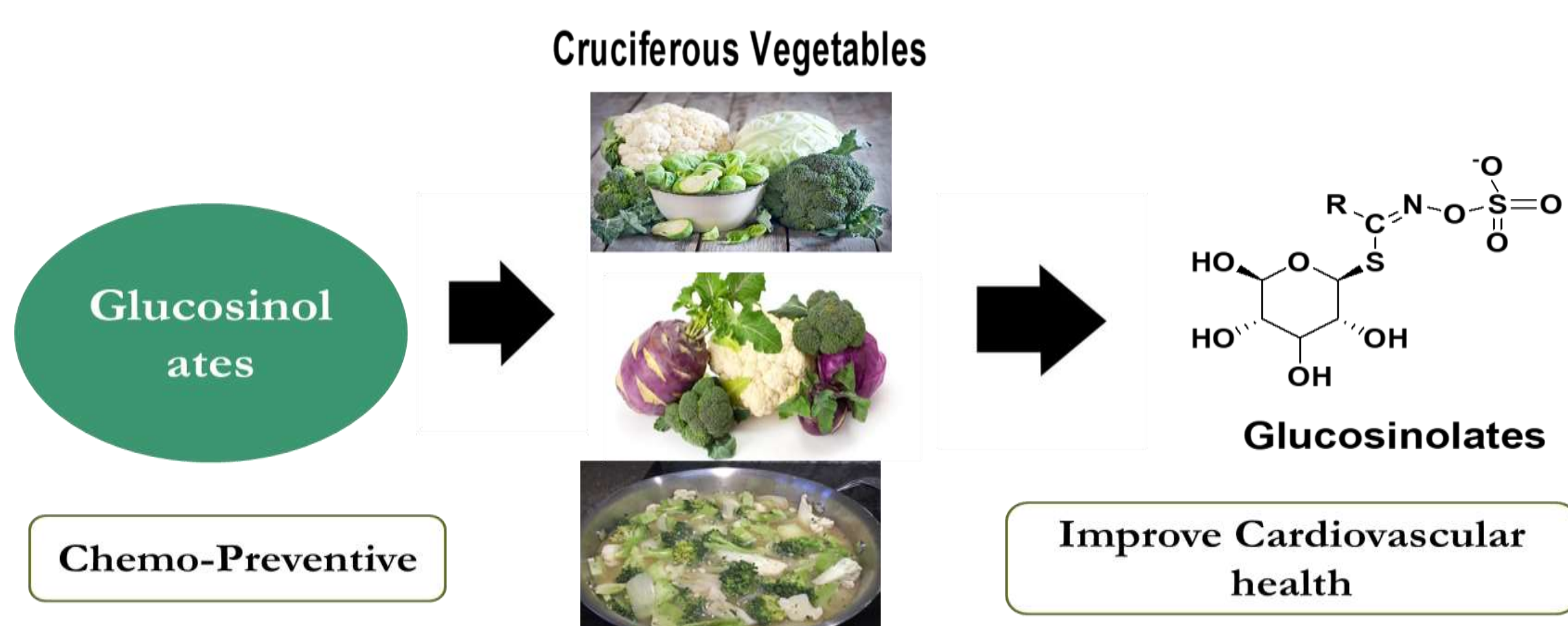
sodeeqaderotimi@gmail.com

Department of Chemistry, Rhodes University, Makhanda, South Africa

INTRODUCTION

Isothiocyanates are an important class of chemical compounds that have been discovered as subunits in both naturally occurring and biologically active compounds. Many isothiocyanate analogues possessing the isothiocyanate motif have been synthesized for possible medical applications after it was discovered that naturally occurring isothiocyanates play a key role in the cancer chemo preventive activities of these plant species [1].

GLUCOSINOLATES AND ISOTHIOCYANATES IN HEALTH



There are many epidemiological studies which support an association between the intake of cruciferous vegetables (i.e broccoli) and a reduced risk of cancer. The bioactive components of these cruciferous vegetables have been reported to reduce expression of many of the cancer related biomarkers in humans [2].

NATURAL ISOTHIOCYANATES FOUND IN CRUCIFEROUS VEGETABLES:

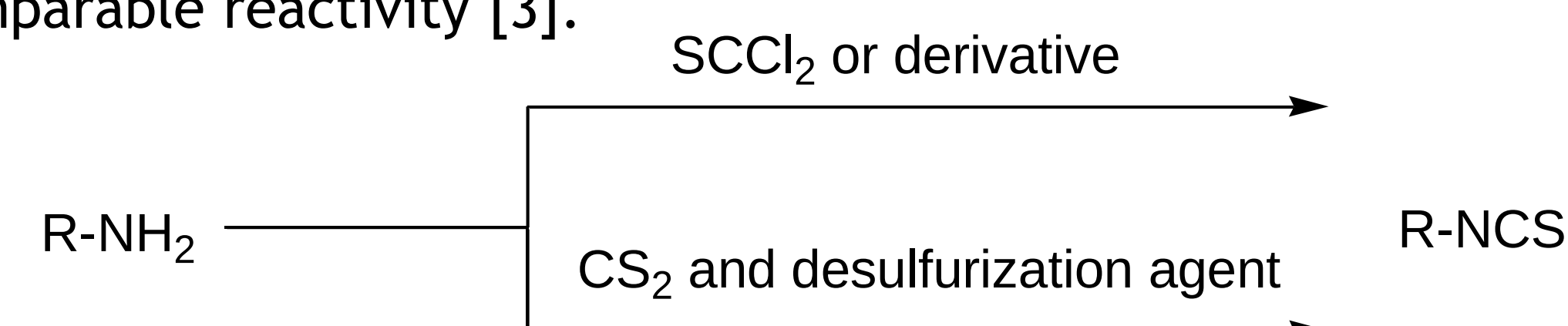


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TRADITIONAL ISOTHIOCYANATE SYNTHESIS

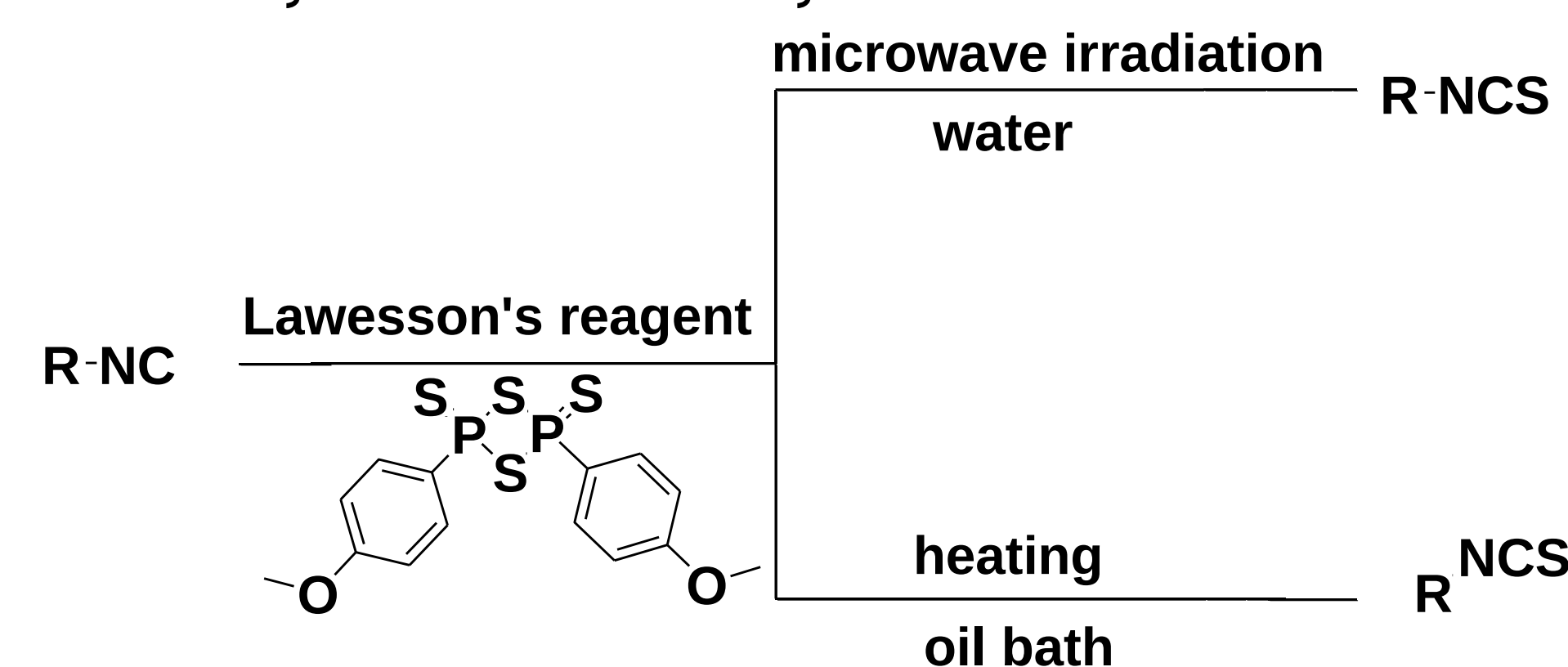
While thiophosgene has often been employed for this transformation, its high toxicity and incompatibility with many functional groups limit its general use. Various thiophosgene equivalents have been developed; however, most are not readily available and often do not afford comparable reactivity [3].



Drawbacks include:
extreme toxicity; expensive reagents; enormous waste generation; tedious operations; limited functionalisation scope

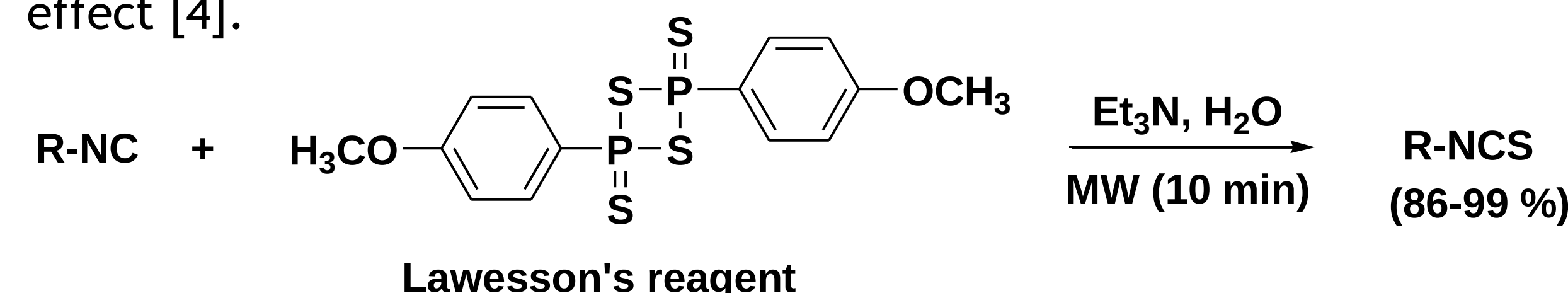
NEW SUSTAINABLE ROUTE TO ISOTHIOCYANATE SYNTHESIS

Considering the effectiveness of Lawesson's Reagent (LR) for the sulfurization reaction and that it is affordable in large scale, we speculated that it could also be effective and practical in the direct thionation of isocyanides to isothiocyanates



AQUEOUS MICROWAVE ASSISTED ISOTHIOCYANATE SYNTHESIS

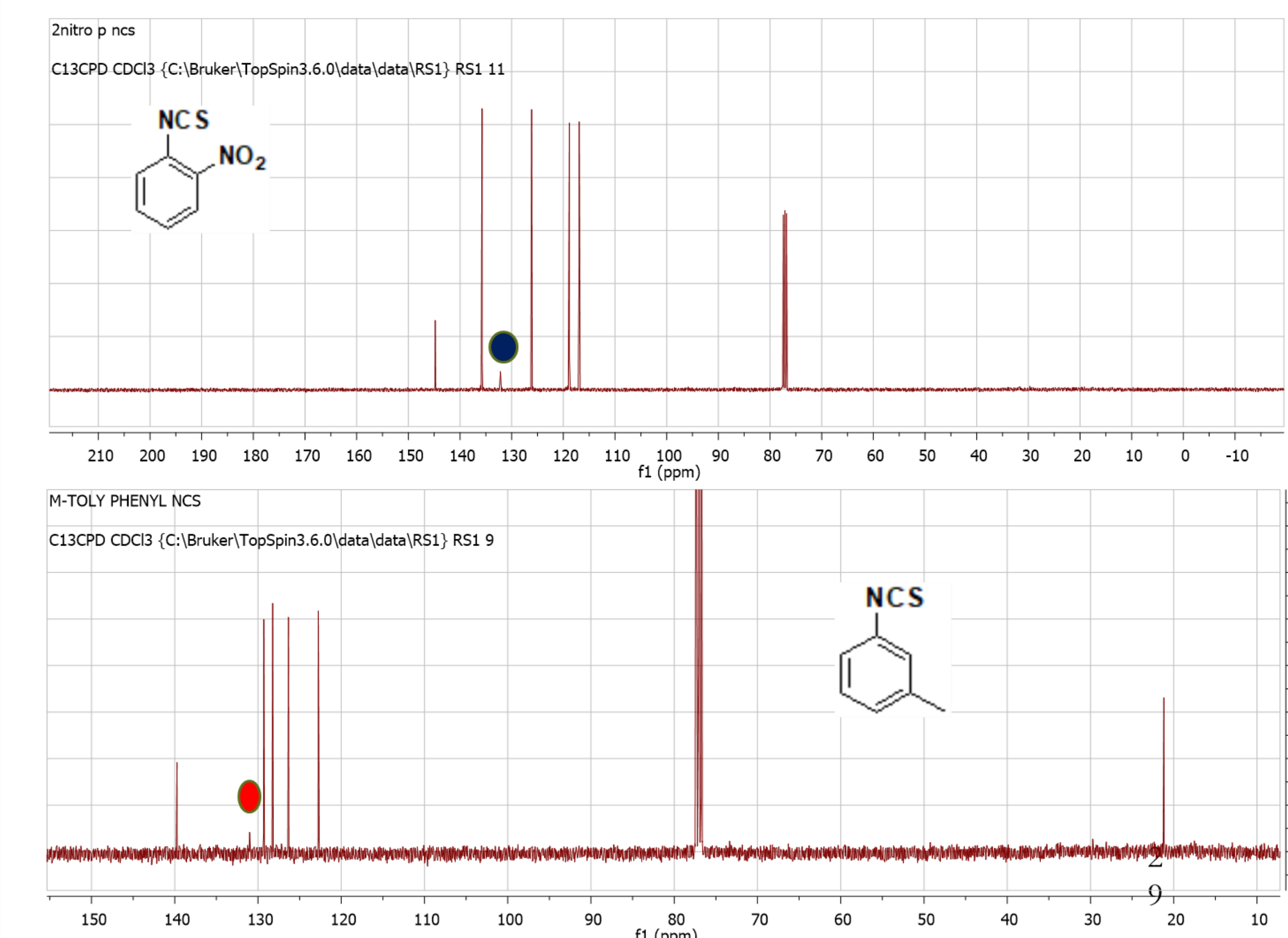
Water has been proven to have a good ability to absorb microwaves, which allows for fast heating of reaction mixtures. Water also serves as a pseudo-organic solvent since the dielectric constant drastically decreases at higher temperatures. It appears that the combination of microwave irradiation and water as a solvent generated a significant synergistic effect [4].



WHY WATER AMONG OTHER SOLVENTS?.



¹³C SPECTRALS OF TWO ITC DERIVATIVES



CONCLUSION

The synthetic procedures presented in this study enabled the rapid and simple acquisition of a structurally diverse isothiocyanates with excellent yields in high purity. The simplicity of operation, the easy work-up procedure, high reaction rates, very mild conditions, excellent yields and environmentally benign are the most important advantages of the present method.

APPRECIATION

Prof. Rui Krause and Dr Vincent Smith
F22 Research Group
Chemistry Department
Rhodes Community
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