SYNLETT
Spotlight 264

Burgess Reagent: From Oblivion to Renaissance in Organic Synthesis

Compiled by Soumava Santra

This feature focuses on a reagent chosen by a postgraduate, highlighting the uses and preparation of the reagent in current research

Soumava received his B.Sc. (Honors) degree in Chemistry from University of Calcutta and M.Sc. degree in Inorganic Chemistry from Indien Institute of Technology, Bombay, India. In 2002, he went to Wayne State University and completed a M.S. degree in Organic Chemistry (2004) under the supervision of Prof. Jin K. Cha. He elected to continue towards his Ph.D. and presently he is working towards his Ph.D. degree under the supervision of Prof. Peter R. Andreana. His research interests are focussed on the development of new microwave-based methodology including multicomponent cascade reactions in the context of green chemistry, synthesis of highly complex and biologically validated small molecule motifs, carbohydrate synthesis and the isolation and synthesis of naturally occurring carbohydrate products.

Department of Chemistry, Wayne State University, 5101 Cass Avenue, Detroit, MI 48202.
E-mail: soumava@chem.wayne.edu

Dedicated to Prof. Peter R. Andreana on the occasion of his 35th birthday.

Introduction

In 1968, E. M. Burgess discovered that methyl N-(triethylammoniumsulphonyl) carbamate salt (**1**),[1] commonly known as the Burgess reagent, could be used as a mild and selective dehydrating agent[2] for the conversion of secondary and tertiary alcohols into alkenes. The dehydration occurs through an internal elimination (E_i) mechanism resulting in *syn*-elimination. In recent years there has been a revival of interest in the Burgess reagent[3] due to its versatility in synthetically useful transformations that have facilitated functional group conversions. The reagent is highly soluble in most common organic solvents including those that are non-polar. The most noteworthy application has been in the cyclodehydration of hydroxy amides and thioamides to afford corresponding heterocycles. Because of the mild conditions as well as high selectivity, the reagent has received wide acceptance in the area of synthetic chemistry.
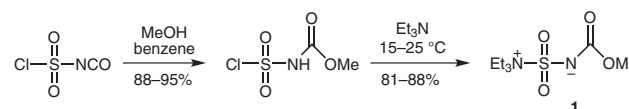
Scheme 1 Preparation of the Burgess reagent.

Abstracts

(A) Claremon and co-workers described an efficient chemoselective synthesis of nitriles from various primary amides in the presence of the Burgess reagent (**1**).[4] The reagent is compatible with other functionalities precluding the need for functional group protection.
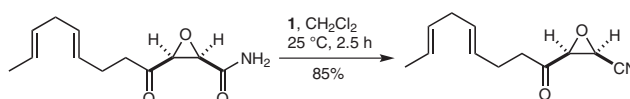
(B) Miller and Kaufman reported the mild and efficient dehydration of oximes to nitriles mediated by Burgess reagent (**1**) or PEG-Burgess reagent.[5] The method is compatible with acid sensitive functionalities.
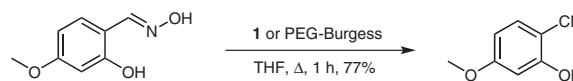
(C) Nitrile oxides are highly reactive intermediates that are normally generated in situ usually in the presence of a suitable dienophile. Mioskowski et al. developed an efficient and convenient synthesis of synthetically useful nitrile oxides from primary nitro-alkanes by using the Burgess reagent.[6]
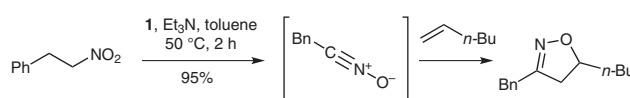
(D) Isocyanides have widespread applications in synthetic chemistry especially in multicomponent coupling reactions. McCarthy et al. have reported a very convenient route towards the synthesis of isocyanides from formamides by using the Burgess reagent (**1**).[7] This is particularly useful for substrates containing halide-sensitive TMS ether groups.
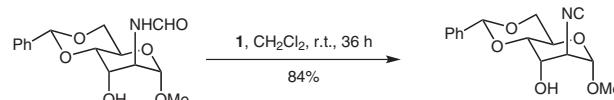
(E) Hudlicky and co-workers have applied the Burgess reagent (**1**) in the synthesis of *trans*-sulfamidates via epoxide ring-opening. Recently, they have developed a chiral version of the reagent (**2**) to synthesize *cis*-sulfamidates which can be converted to synthetically useful *cis*- and *trans*-amino alcohols.[8]
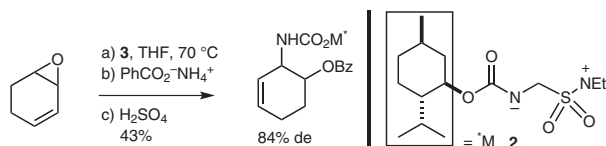

(F) Sulfamides and sulfamidates are important pharmacophores and can be readily converted to other derivatives. Nicolaou and co-workers showed that 1,2-diols[9] and epoxy-alcohols[9] react with the Burgess reagent (**1**) to form both symmetrical and non-symmetrical sulfamidates, whereas amino-alcohols[10] react with the Burgess reagent (**1**) to form both symmetrical and non-symmetrical sulfamides.
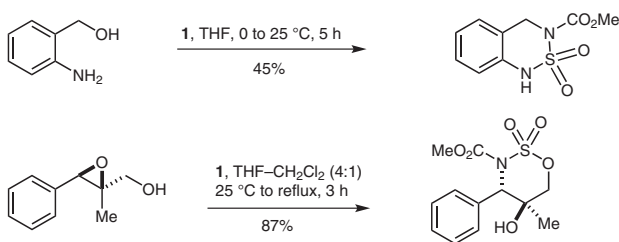

(G) Glycosylamines are prominent in glycopeptides and glycoproteins and have selective RNA-binding ability. However, existing methods lack substrate compatibility and result in variable stereoselectivity (α/β). Nicolaou and co-workers reported a convenient method for the synthesis of both α- and β-glycosylamines in the presence of the Burgess reagent (**1**).[11]
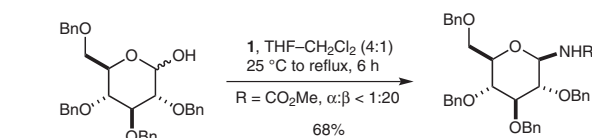

(H) The acyl urea moiety has been an important functional handle in medicinal chemistry and has been widely incorporated in commercial drugs. Makara and co-workers reported that the Burgess reagent (**1**) can be used to activate carboxylic acids and can be treated with amines to synthesize acyl ureas and amides under microwave irradiation. This method is very convenient because it directly converts carboxylic acids into the acyl urea moiety.[12]
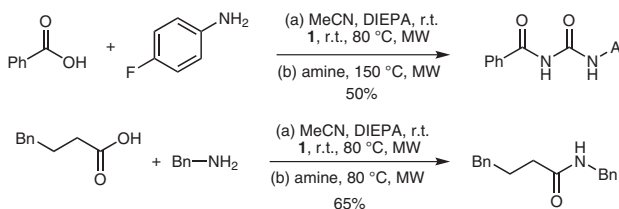
(I) Hudlicky and co-workers reported a convenient synthesis of disulfides from thiols in the presence of the Burgess reagent (**1**).[13] This method has several advantages over other methods since no external base is required, it is easy to prepare and provides the products in high yields.
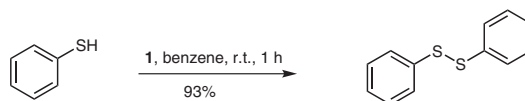
(J) Sulfilimines have useful applications in synthesis, catalysis and medicinal chemistry. Recently, Raghavan and co-workers have shown that sulfilimines can be easily prepard from solfoxides in presence of Burgess reagent (**1**) at room temperature.[14]
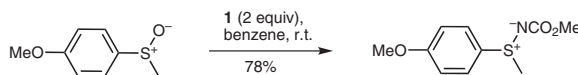
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