



## DEHYDRATION IN WATER: IMINE PREPARATION

Aarif Latif Shaikh<sup>1</sup>, Ramesh Naresh Yadav<sup>2</sup>, Bimal Krishna Banik<sup>3\*</sup>

<sup>1</sup>Aragen Life Sciences Pvt. Ltd. (Formerly known as GVK Biosciences Pvt. Ltd.), Mallapur, Hyderabad 500076, Telangana, India; <sup>2</sup>Veer Bahadur Singh Purvanchal University Jaunpur-222003 (U.P) INDIA; <sup>3</sup>Department of Mathematics and Natural Sciences, College of Sciences and Human Studies, Deanship of Research, Prince Mohammad Bin Fahd University, Al Khobar 31952, Kingdom of Saudi Arabia;  
Email: [bimalbanik10@gmail.com](mailto:bimalbanik10@gmail.com); [bbanik@pmu.edu.sa](mailto:bbanik@pmu.edu.sa)

### Abstract:

Some optically active imines are prepared from aldehydes and amines in the presence of water through dehydration. Such reactions do not proceed well with aromatic aldehydes.

### Key Words:

Imines, Dehydration, Reactive aldehyde

### Introduction:

Schiff base [also called imine or azomethine ( $-RC = N-$ )] is a functional group with general formula  $R'R''C = NR$ , where  $RR'R''$  are aryl, alkyl, cycloalkyl, or heterocyclic groups was first discovered by a German chemist, Hugo Schiff in 1864 [I-II]. Schiff base compounds are condensation products of primary amine and carbonyl compound (aldehyde or ketone). Reaction of carbonyl compounds with primary amines produce imines through dehydration. However, such dehydration requires dry conditions and catalyst. During our research on  $\beta$ -lactams [III], we prepared a few imines starting from reactive aldehydes and primary amines in water. In contrast, aromatic aldehydes on reaction with the same primary amines failed to produce imines even in low yield in the presence of water. This paper describes the preparation of imines in water.

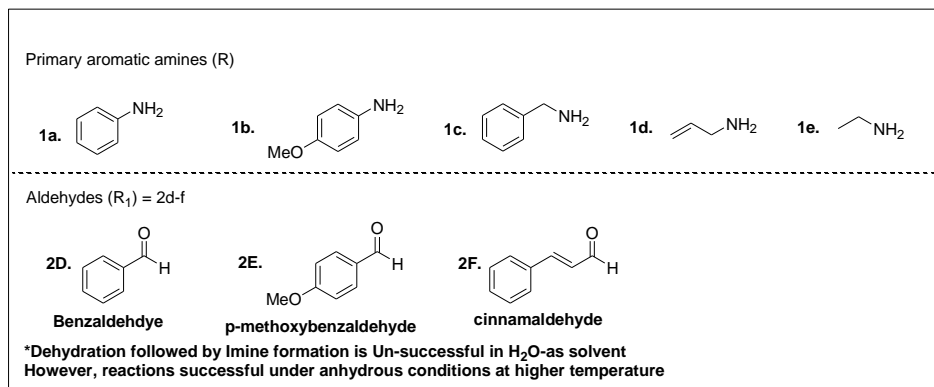
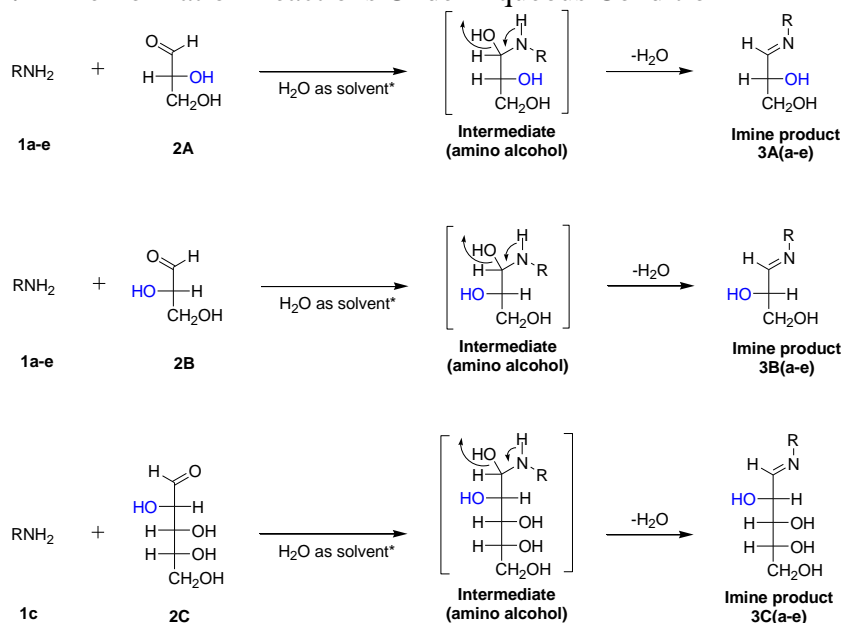
### Results and Discussions:

D-Glyceraldehyde (**2A**), L-glyceraldehyde (**2B**) and D-arabinose (**2C**) aldehyde in reaction with diverse aromatic amines – aniline (**1a**), *p*-anisidine (**1b**), and benzylamine (**1c**) in water produced the corresponding imines **3A-C(a-c)** in quantitative yield [IV]. The same reaction failed to proceed with benzaldehyde (**2D**), *p*-methoxybenzaldehyde (**2E**) and cinnamaldehyde (**2F**). On the other hand, imines **3A-C(d)** and **3A-C(e)** were prepared with **2A-C** and allyl amine (**1d**) and ethyl amine (**1e**).

The above reactions are example of nucleophilic addition and subsequent dehydration. It seems nucleophilic addition of the aromatic amines to the sugar aldehydes takes place readily

in water due to the high reactivity of the carbonyl partners. Once formed the intermediate amino-alcohol undergoes dehydration to produce the imines **3A-C(a-e)**. On the other hand, the relatively less reactive aromatic aldehydes (**2D-F**) cannot be attached by the same aromatic amines as these are not reactive enough. These aldehydes can form imines **3D-F(a-e)** at reflux conditions using a solvent, in the presence of dehydrating agents. It appears that the intermediate amino alcohols are able to dehydrate even in the presence of water, if the reactivity of the partners is high (**Scheme 1**).

**Scheme-1.** Imine Formation Reactions Under Aqueous Condition



**Experimental:**

Sugar alcohol (5 mmol) and primary amines (5 mmol) were added to water (10 ml) at room temperature. The reaction mixture was stirred for 1h. Dichloromethane (20 mL) and brine (10 ml) were added to the reaction mixture, it was shaken well and organic part was collected. It was then evaporated to afford the imines in more than 90% yield.

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**References:**

- I P.G. Cozzi, Metal-Salen Schiff base complexes in catalysis: practical aspects *Chem. Soc. Rev.*, 33 (7), **2004**, 410-421
- II I. Kostova, L. Saso, Advances in research of Schiff-base metal complexes as potent antioxidants, *Curr. Med. Chem.*, 20 (36), **2013**, 4609-4632.
- III a) I. Banik, F. F. Becker, B. K. Banik, *J. Med. Chem.* **2003**, 46, 12; b) B. K. Banik, F. F. Becker, I. Banik, *Bioorg. Med. Chem.* **2004**, 12, 2523; c) B. K. Banik, I. Banik, F. F. Becker, *Bioorg. Med. Chem.* **2005**, 13, 3611; d) B. K. Banik, B. Lecea, A. Arrieta, A. de Cozar, F. P. Cossio, *Angew. Chem., Int. Ed.* **2007**, 46, 3028. egrocka, M. S. Manhas, A. K. Bose, *Heterocycles* **2009**, 78, 2443; e) B. K. Banik, I. Banik, F. F. Becker, *Eur. J. Med.Chem.* **2010**, 45, 846; f) A. L. Shaikh, E. Orlando, B. K. Banik, *Helv. Chim. Acta* **2011**, 94, 2188; g) A. L. Shaikh, B. K. Banik, *Helv. Chim. Acta* **2012**, 95, 839.
- IV B. K. Banik, M. S. Manhas, Z. Kaluza, K. J. Barakat and A. K. Bose, *Tetrahedron Lett.*, **1992**, 33, 3603.

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