

EXPERIMENTAL EVALUATION OF TITRATIONS OF BENZIMIDAZOLES AND METAL BENZIMIDAZOLES IN NON- AQUEOUS SOLVENTS

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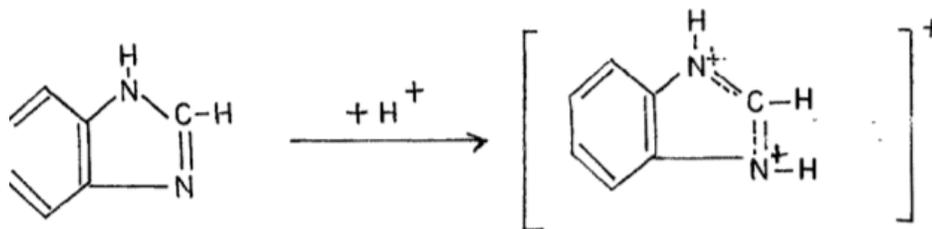
Abstract

The present article is taken mainly from these two sources. The titrations in non-aqueous solvents possess the prudence of a perfect analytical strategy for speed, precision and simplicity of technique and equipment. This new technique in analytical science uses conventional apparatus and either a visual indicator or potentiometric means for detecting the end point, as in titration in aqueous solution. It has a unique value of increasing the number of substances to which a volumetric technique for analysis might be applied. Titrimetric strategies using non-aqueous solvents are getting increasingly more recognition in pharmacopeal techniques for analysis, research and industry. Both "United States Pharmacopea XVI" and "English Pharmacopea, 1958 employ non-aqueous titrimetry in a portion of their authority examines Titrations using visual Indicators are not reasonable for shaded solutions. In such cases, potentiometric titrations are unmistakably progressively reasonable. Truth be told, the appropriateness of an indicator for a particular titration must be checked by performing a potentiometric and observing the shading changes of the indicator, simultaneously.

1. INTRODUCTION

The benzimidazoles are solids with high melting and high boiling points. They are dissolvable in polar and sparingly dissolvable in non-polar solvents. The pseudoacidic character of benzimidazole and many of its derivatives is reflected in the capacity to shape salts with metals. Most significant among these is the sparingly solvent silver salt which is framed when arrangement of silver nitrate is added to an answer of benzimidazole in boiling water. It is a crystalline strong which disintegrates in weaken mineral acids or acidic corrosive. Sparingly dissolvable accelerates are additionally obtained with ammoniacal arrangements of copper, cobalt, cadmium and zinc particles. The capacity to respond with Grignard reagent to give N-magnesium halides likewise mirrors the acidic idea of the benzimidazole. Various crystalline salts, (for example, lithium, sodium, potassium and barium) have been set up by the expansion of the fitting metal amide to an answer of benzimidazole in fluid smelling salts. These salts hydrolyse upon introduction to water, with the recovery of benzimidazol. The benzimidazoles are predominantly

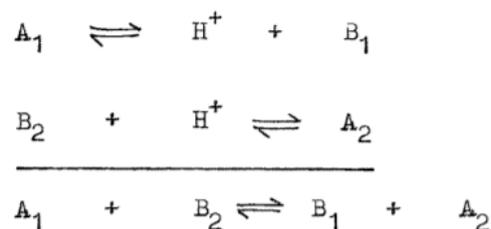
essential compounds having capacity to frame salts - with acids. The essential properties result from the capacity of pyridine nitrogen to acknowledge a proton.



2. BEHAVIOUR OF BENZIMIDAZOLES IN VARIOUS SOLVENT SYSTEMS

2.1 The study of acids and bases in non-aqueous solvents:

The Arrhenius theory of electrolytic dissociation of acids and bases in water is reasonable to explain the titration in aqueous solutions only. This theory is clearly unsuited to explain the reactions in non-aqueous solvents which could conceivably contain hydrogen or hydroxylion. Germann (1) considered that any substance that increases the solvent cation concentration is a corrosive, while any substance that increases the solvent anion concentration is a base. This theory appears satisfactory for ionisable solvent, yet is incapable of explaining corrosive base reaction in non-ionisable solvents, for example, dioxan, benzene. Bronsted considered an acid (A) as any compound or ions that can give up a proton and a base (B) as any compound or ion that can accept a proton.



A base may be a neutral molecule, such as ammonia, an anion (CH_3COO^-) or even a cation ($Al(OH)_2^+$). A substance cannot go about as a corrosive, unless a base is present to accept a proton and the other way around. Bronsted reported that a solution of picric corrosive, in an inert solvent like benzene isn't ionized and hence, the solution is lackluster and none conducting. On the off chance that a solution of aniline in benzene is now added to the picric corrosive broke up in benzene, the solution winds up yellow and the conductivity increases. This supports the Bronsted theory. G.N. Lewis considered a corrosive as an electron pair acceptor and a base as an electron pair donor. This theory considers substances like

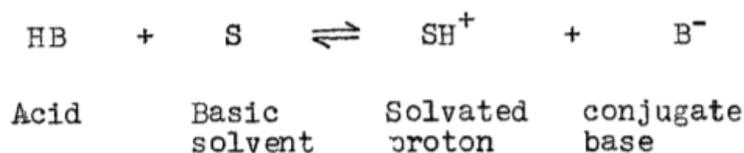
aluminum chloride and stannic chloride as corrosive, as they can accept the pair of electrons. These substances are alluded to as Lewis-acids.

- **Ionisable Solvents:**

Examples of this class are water, alcohol, acetic acid, etc. The two acids and bases respond with the solvent of this group. Such solvents are additionally subdivided into protogenic and amphiprotic solvents. The protogenic solvents are strongly acidic substances, for example, sulphuric and hydrofluoric acids. The amphiprotic solvents (exhibiting feebly both acidic and fundamental properties) are liquids which are ionized to slight extent, for example, water, alcohols and acidic corrosive. They exhibit both protogenic and protophilic properties.

- **Non-ionisable solvents:**

This class includes ethers (including dioxan) and amines. These solvents are also referred to as protophilic solvents and will react with an acidic solute with the formation of a solvated proton together with a conjugate base of the acid.



(This is referred to as solvolysis)

- **Inert solvents:**

Typical examples of this type are benzene, chloroform and carbon tetrachloride. These are likewise alluded to as aprotic solvents. They are neutral substances, synthetically inert and possess low dielectric constant. Aprotic solvents are often added to solvents which support ionization, in request to depress solvolysis of the neutralization product and to sharpen the end point.

- **Non-aqueous titrations:**

Non-aqueous titrations of acidic and basic substances might be done-without hardly lifting a finger as titrations in aqueous solutions. Titrations of many such compounds in - water are restricted in scope, on account of low solvency in - water and the poor acidic and basic intrinsic strength of many of the substances. Titration in non-aqueous solvents makes possible, precise determination of truly hundred of acids and bases, which cannot be titrated satisfactorily in water.

Amongst the basic substances (2, 3) which have been effectively, titrated with acetous perchloric acid (perchloric acid broke down in frosty acidic acid) are the primary, secondary and tertiary amines, either separately or in blends containing all the three types of compounds. Alkaloids and a portion of the sulphonamides might be delegated amines with the end goal of non-aqueous titrimetry. The purines and pyrazolones as - well as the organic salts of either the metals or the amines are amenable to this type of measure. The halide salts of the amines, quaternary ammonium compounds and many of the metals respond with mercuric acetic acid derivation to free an equivalent amount of the acetic acid derivation ion which can be promptly titrated with acetous perchloric acid. Many acidic substances for example, acids, phenols, enols and imides and sulphonamides can be evaluated using potassium methoxide in benzene + methanol as a titrant.

3. EXPERIMENTAL

In the present work, BMA, 2-HMBMA, 2-HEBMA and 2-HBBMA are titrated in the following solvent mixtures.

1. Glacial acetic acid + chloroform
2. Ethylene glycol + isopropanol.

All benzimidazoles have been titrated against perchloric acid prepared in dioxan. Perchloric acid has been standardized with potassium hydrogen phthalate just as anhydrous sodium carbonate broke down in chilly acidic acid. Are depicted only graphically in Figures 3.1 and 3.2 There is a decent agreement between the qualities in both the experiments. Normality of the acid turns out to be 0.201 N. This acid was utilized for the titration of BMA and metal-benzimidazoles. In any case, for titrations of different benzimidazoles, 2-HMBMA, 2-HEBMA and 2-HBBMA, 0.185 N perchloric acid was used. The end point was detected potentiometrically. All the chemicals used were A.R., B.D.H. or G.R. grade. Dioxan was purified by adding NaOH and refluxing it; followed by distillation. Beckman pH meter model E-2 equipped with glass and calomel electrodes was employed. Chloroform was used to improve the end point for the titration. The accuracy of the instrument was ± 5 mV. The following sets were prepared for titrations.

4. EXPERIMENT EVALUATION

1. 0.100 gm. BMA + 20 ml. ethylene glycol + 20 ml. isopropanol titrated against 0.201 N HCIO_4 in dioxan
2. 0.100 gm. 2-HMBMA₄ + 20 ml. glacial acetic acid + 30 ml. chloroform titrated against 0.185 N HCIO_4 in dioxan

- 0.100 gm. 2-HMBMA + 20 ml. ethylene glycol + 20 ml. isopropanol titrated against 0.185 N HClO_4 in dioxan 3.5 A.
- 0.100 gm. 2-HEBMA. + 20 ml. glacial acetic acid + 30 ml. chloroform titrated against 0.185 N HClO_4 in dioxan 3.5 A
- 0.100 gm. 2-HEBMA. + 20 ml. ethylene glycol + 20 ml. isopropanol titrated against 0.185 N HClO_4 in dioxan 3.5 B
- 0.100 gm. 2-HBBMA + 20 ml. glacial acetic acid + 30 ml. chloroform titrated against 0.185 N HClO_4 in dioxan 3.6 A
- 0.100 gm. 2-HBBMA + 20 ml. ethylene glycol + 20 ml. isopropanol titrated against 0.185 N HClO_4 in dioxan 3.6 B

5. DISCUSSION

Results of titration of benzimidazoles are given in Tables 3.1 to 3.4 and depicted graphically in Figures 3.3 to 3.6. From the figures, it is clear that the benzimidazoles can be successfully titrated in the non-aqueous media. In the case of BM&, its titration in glacial acetic acid + chloroform was not successful, as insoluble substance was formed during the titration. However, its titration in ethylene glycol + isopropanol.

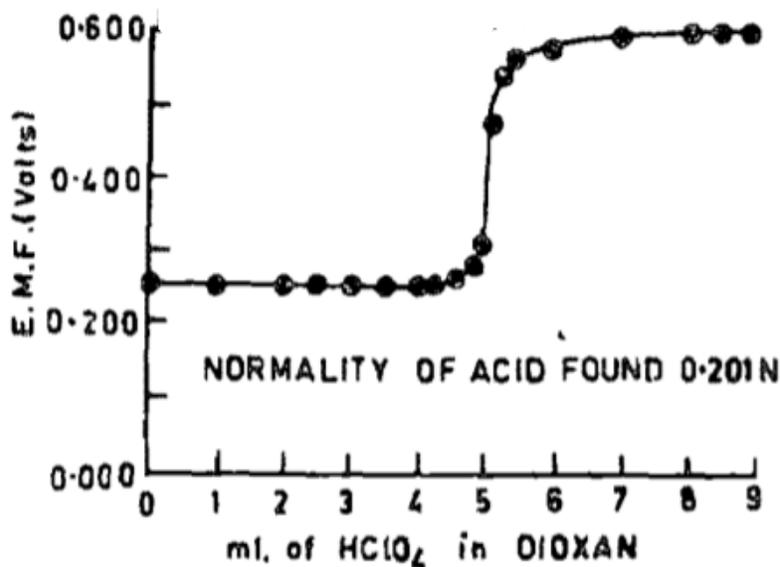


Figure 1 Standardization of mcid4 acid in dioxin by 0.204g.potassium

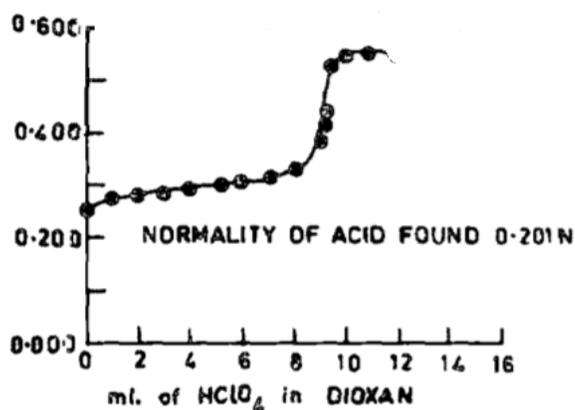


Figure 2 Standardization of mcid4 acid in dioxin by 0.1g. Sodium carbonate

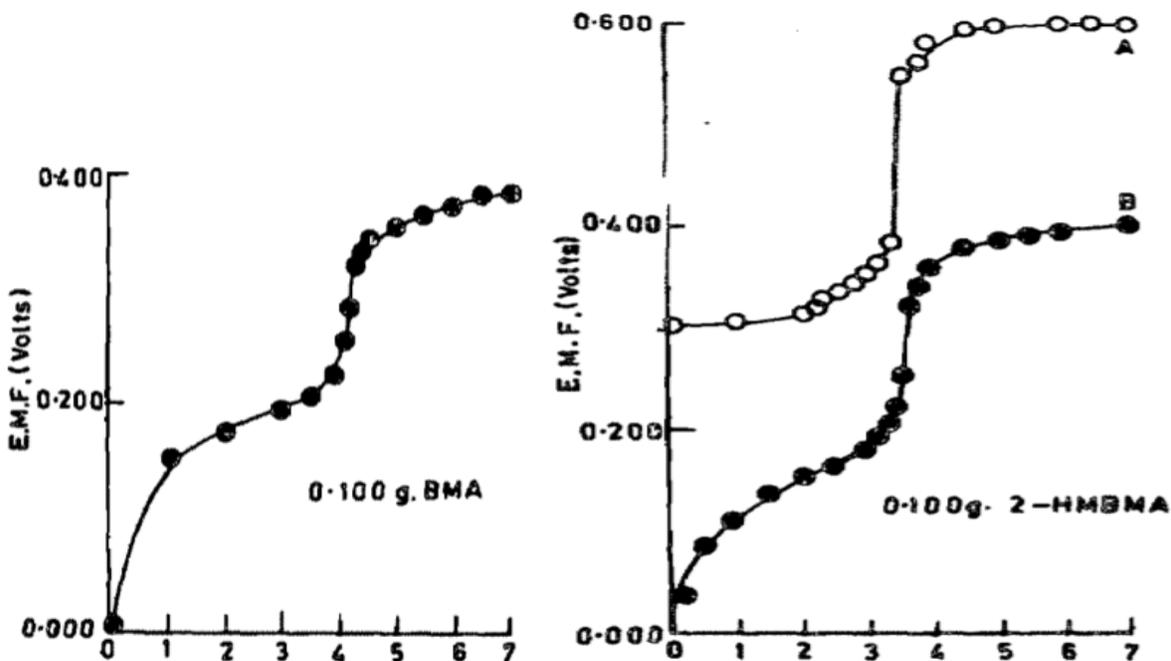


Figure 3 Non -Aqueous Titrations of Benzimidazoles

6. CONCLUSION

It is concluded that was effective as shown In Fig. for the remaining three benzimidazoles the titrations were fruitful in frigid acidic acid + chloroform just as in ethylene glycol + isopropanol. From the figures, it might be commented that the sharper end points are obtained when frigid acidic acid + chloroform are utilized as solvents. Again in both solvent frameworks there is a decent agreement between the estimations of the determined and watched end points. One mole of benzimidazoles consumes one mole of perchloric acid in dioxan. This confirms the monoacidity of the ligands.

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