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Determination of Water Content in Organic Solvents using a Novel Rapid Test Kit

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Abstract: *A Novel Test for determining water in important organic solvents like Acetone, Ethyl Acetate, 1,4- Dioxane, Petroleum Ether in different ranges of volume % were explored. The test strips of Bromocresol Green (BG) , Methyl Orange (MO) indicator of dyes were used to measure the acidity of the organic solution. The Calibration Curve were used for detection of an unknown solution with water content. This was an attempt to explore solvatochromic effect on the indicator dyes, which inturn even measured the volume % of water in organic solvents. Since analysis time required was only 10 minutes, this method could be used as a handy and a quick indicator of water in organic solvents.*

Keywords: Reliable; Cost Effective; Eco-Friendly; Handy; Novel Rapid Test Kit

I. INTRODUCTION

A Novel rapid test kit is developed for determining the percentage of water and this test method is reliable, cost effective, handy and eco -friendly. With almost no disadvantage provided, while preparing the test strips, we must have to take care that the strips should not be contaminate by any means and whatever apparatus you will use, rinse and clean it with distilled water for better or zero errors and the aim of the present work was the determination of percentage of water content in test solution of organic solvents.

II. METHODOLOGY

We used the following organic reagents (of Analytical grade) : Bromocresol Green (BG), color change at pH 3.8 - 5.4 (yellow to blue), Methyl Orange (MO), color change at pH 3.1 - 4.4 (red to yellow). Organic solvents (Chemically pure, Analytical grade), Acetone, Ethyl acetate, 1,4-Dioxane and Petroleum ether. The following matrixes were used ; what man filter paper no.1 of Grade 1:11 µm (medium flow filter paper) the most widely used filter paper for routine applications with retention and flow rate. To prepare test strips, matrixes were presoaked in 0.05% reagents (BG or MO) for 5 minutes. Strips from indicator matrixes 2 x 10 cm in size were sealed into a plastic zipper bag after drying under the IR Lamp for approximately 30 minutes (for complete dry). A 10 ml portion of an organic solvent and one test strip were dipped in a 100 ml beaker and covered it with watch glass, allow it to run for 10 minutes. Then remove the test strip and place on white clean surface like for example white tile then measure the colored zone with measurement scale, water content was determined (Figure). and before proceed with the experiment, take pH of the each test solution.

III. RESULTS AND DISCUSSION

To determine water in organic solvents, we used the ability of indicators to change color depending on the pH of the medium. To prepare indicator matrixes, the Bromocresol Green (BG), Methyl Orange (MO) were choosen and to prepare test strips, whatman filter paper no.1 were choosen in the measurement of 2 cm in breadth and 10 cm in length. The varied percentage composition of organic solvents in water is made to run on the indicator paper strip, the indicator changes the color under the influence of the acid medium. To determine water, the test strips should be dipped in test solution and allowed to run for about 10 minutes. Thus, the colored zone, the length of which in proportional to the concentration of water in organic solvents, are found and measured used the graphical plot of length of color change

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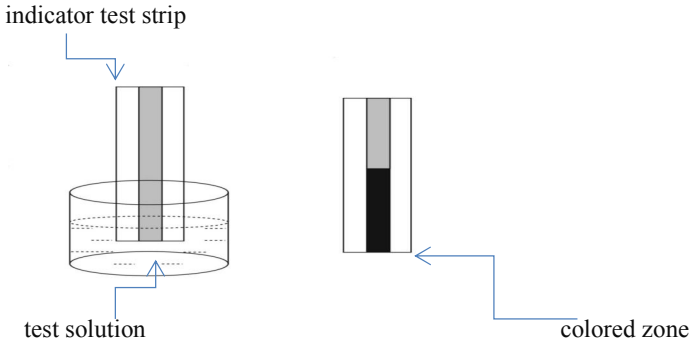
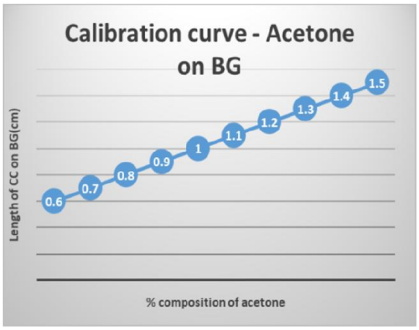
Vs. percentage composition of organic solvents in water to get the calibration curve. Calibration curve data is used further for determination of the water content in organic solvents.

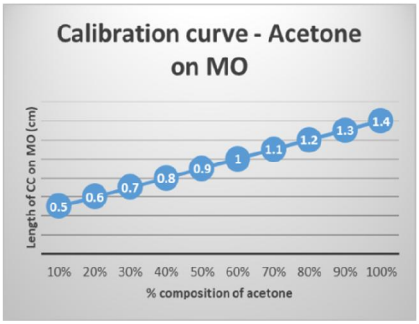
3.1 A Test Method for Determining Water in Organic Solvents



%composition of acetone	Length of colour change on BG Paper(cm)
10%	0.6
20%	0.7
30%	0.8
40%	0.9
50%	1.0
60%	1.1
70%	1.2
80%	1.3
90%	1.4
100%	1.5

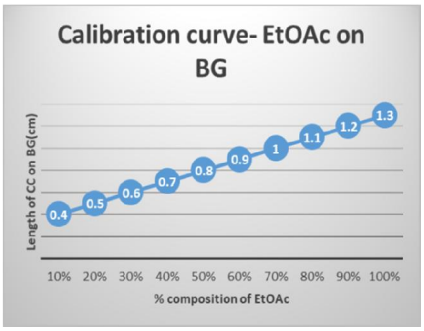


%composition of acetone	Length of colour change on MO Paper(cm)
10%	0.5
20%	0.6
30%	0.7
40%	0.8
50%	0.9
60%	1.0
70%	1.1
80%	1.2
90%	1.3
100%	1.4



y= 0.01x + 0.4

%composition of EtOAc	Length of colour change on BG Paper(cm)
10%	0.4
20%	0.5
30%	0.6
40%	0.7
50%	0.8
60%	0.9
70%	1.0
80%	1.1
90%	1.2
100%	1.3



y= 0.01x + 0.3

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10%	0.4
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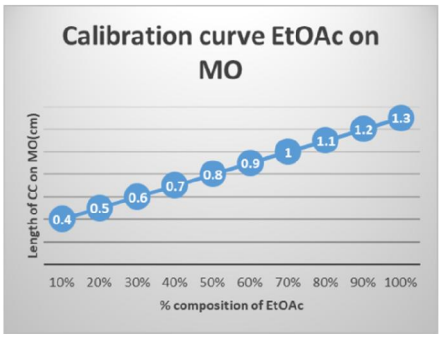
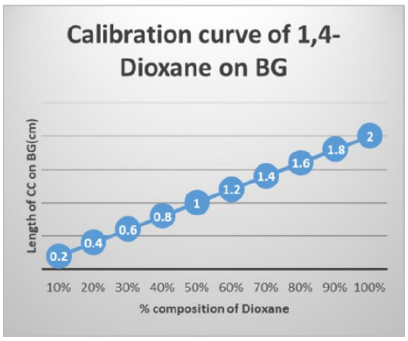
40%	0.7
50%	0.8
60%	0.9
70%	1.0
80%	1.1
90%	1.2
100%	1.3



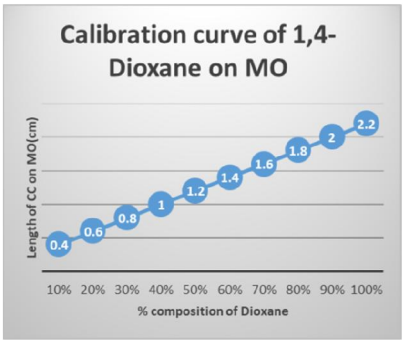
y= 0.01x + 0.3

%composition of Dioxane	Length of colour change on BG Paper(cm)
10%	0.2
20%	0.4
30%	0.6
40%	0.8
50%	1.0
60%	1.2
70%	1.4
80%	1.6
90%	1.8
100%	2.0



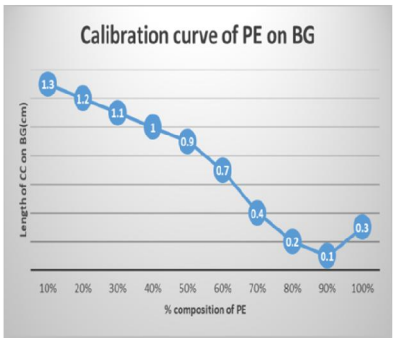
y= 0.02x + 0.2

%composition of Dioxane	Length of colour change on MO Paper(cm)
10%	0.4
20%	0.6
30%	0.8
40%	1.0
50%	1.2
60%	1.4
70%	1.6
80%	1.8
90%	2.0
100%	2.2



y= 0.01x + 0.2

%composition of PE	Length of colour change on BG Paper(cm)
10%	1.3
20%	1.2
30%	1.1
40%	1
50%	0.9
60%	0.7
70%	0.4
80%	0.2
90%	0.1
100%	0.3



y= -0.01x + 1.4

The calibration plots were linear (tables and graphs) water can also be determine by the proposed procedure. The accuracy and reproducibility of the results of determining water was estimated by the equation. The procedure was tested on real objects: Acetone , Ethyl acetate, 1,4-Dioxane, Petroleum ether. The results of determining water in the

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above media are given in the tables and graphs and the duration of the analysis was no more than 10 minutes with acaccuracy. We have been getting reproducible results and appropriate percentage composition of water in the organic solvents using this calibration curves.

IV. CONCLUSION

It is Green method with less wastage, non – hazardous environment, cost effective. But while performing the test we have to take care that the strips should not be contaminated, it should be completely dried and the indicators must be used for the strip preparation in proper proportion. Since world is looking for the Green chemistry our rapid test kit will be the perfect option, for that rapid test method is inexpensive, easily accessible, non - hazardous and it is much more useful for industries as well as professionals.

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