

Proceeding

The 2nd International Conference of
the Indonesian Chemical Society 2013

IC  CS 2013

Research in Chemistry for Better Quality of Environmental

Universitas Islam Indonesia, Yogyakarta, Indonesia
October, 22 - 23th 2013

Abdul Kahar Muzakkir, Conference Hall
Universitas Islam Indonesia (UII), Yogyakarta.
Kampus Terpadu, Jl. Kaliurang KM 14,5 Sleman, Yogyakarta.

Preface

The international conference is an annual conference of the Indonesian Chemical Society (Himpunan Kimia Indonesia, HKI). In the year 2013, the mandate of the organizing committee was given to the HKI Yogyakarta branch and also supported by Department of Chemistry of Universitas Negeri Yogyakarta (UNY), Department of Chemistry of Universitas Gadjah Mada (UGM), Department of Chemistry of Universitas Islam Negeri Sunan Kalijaga (UIN Suka), National Nuclear Energy Agency (BATAN Yogyakarta), and Volcano Investigation and Technological Development Center (BPPTK Yogyakarta). For the year 2013, ICICS 2013 is hosted by Department of Chemistry, Faculty of Mathematics and Natural Sciences, Islamic University of Indonesia, Yogyakarta from October 22 – 23, 2013. This conference was also prepared to celebrate 70th anniversary of Universitas Islam Indonesia.

The Scientific Programme of ICICS2013 comprises the following:

1. Invited Speaker 11 papers
2. A total 256 paper for parallels sessions
 - a. Organic Chemistry 32 papers
 - b. Inorganic Chemistry 43 papers
 - c. Physical Chemistry 37 papers
 - d. Analytical Chemistry 68 papers
 - e. Education Chemistry 23 papers
 - f. Biochemistry 43 papers

The breakdown of the presentation is as follows:

Session	Oral	Poster	Total
Invited Speaker	11	0	11
Organic Chemistry	25	7	32
Inorganic Chemistry	38	5	43
Physical Chemistry	31	6	37
Analytical Chemistry	61	7	68
Education Chemistry	22	1	23
Biochemistry	34	8	43
Total	222	34	256

Yogyakarta, 25th November 2013

 ICICS 2013

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Calorimeter Design Being Monitored by Digital Microscope

Tri Mulyono*), Dwi Indarti*), Fitri Puji Lestari,

*)Lecturer of Dept of Chemistry, University of Jember, Indonesia
Jln. Kalimantan 37, Jember 68121**Abstract**

The purpose of this research is to make simple calorimeter design using a digital microscope that can be used for monitoring of temperature in a simple calorimeter and to determine the accuracy and precision of that. This simple calorimeter is made of several components such as styrofoam cup, thermometer, digital microscopes, and computers as the main controller. The simple calorimeter has been tested on determination of the neutralization enthalpy of the strong acid (HCl) with a strong base (NaOH), ammonium chloride salt (NH₄Cl) with a strong base (NaOH) and a strong acid (HCl) and a weak base (NH₄OH). The enthalpy of the sample results were compared with the result value of the enthalpy in the literature. The results showed that the measurement of the enthalpy of neutralization reaction of NaOH with HCl and HCl with NH₄OH has good accuracy namely 98.0% - 99.4%. While measurements of reaction enthalpy NH₄Cl with NaOH has little accuracy namely 6.9% - 11.5%.

Keywords: Calorimeter, Enthalpy Neutralization, Digital Microscope, Thermometer.

1. Introduction

A solid has two types of thermal energy stored in form of the vibrational energy where atoms vibrate around the position of equilibrium and kinetic energy of free electrons. When a solid absorbs heat the internal energy stored in the solid increases as it is indicated by the rise in temperature. The change of energy due to temperature can determine the properties of the thermal properties of solids. One of the thermal properties is the capacity of heat (Sudirham and Ning, 2010).

The heat capacity of the media or samples, such as liquids, is often determined by the calorimetric method (Richner et al, 2010). Calorimeter is a tool that often used to measure changes of heat during chemical reaction take place. Calorimeter tools commonly used in the laboratory is flask or cup calorimeter. The principle of this instrument is to measure the changes of temperature of reaction and estimation of capacity of heat can be used to estimate the heat of reaction well (Rufiati, 2011).

The flask calorimeter is often used as the tool because it is easy to use and not too expensive. Observations of temperature were carried out on the device manually or with the naked eye, so it is

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likely the data observations are less scrupulous. Therefore in this research, we make modifications to the tool of observation of temperature using a digital microscope.

The purpose of this study is to determine the level of resolution of the temperature with a thermometer readings monitored with regular digital microscope, to determine the effect of temperature on the value of C_p calorimeter and to determine the feasibility of the calorimeter is made to determine the enthalpy of neutralization.

2. Experimental

2.1 Reagents

All chemicals were of reagent grade. The deionised water (Millipore, Bedford, MA, USA) was used throughout the experiments. Stock solutions ($0,5 \text{ mol L}^{-1}$) of oxalate were prepared from their potassium salts. Stock solutions ($0,5 \text{ mol L}^{-1}$) of HCl were prepared from concentrated HCl 37%. Stock solutions ($0,5 \text{ mol L}^{-1}$) of NH_4Cl oxalate were prepared from their ammonium salts.

2.2 Apparatus

The schematic diagram of simple Calorimeter with digital microscope is shown in Fig. 1. Calorimeter consists of a cup styrofoam, alcohol thermometer, stirrer and digital microscope. Styrofoam is used for mixing the reactants. Type of digital microscope is Dino-Lite ProAM413. Digital microscope is placed adjacent to the thermometer. This microscope is used to monitor changes in temperature caused by endothermic or exothermic reaction.

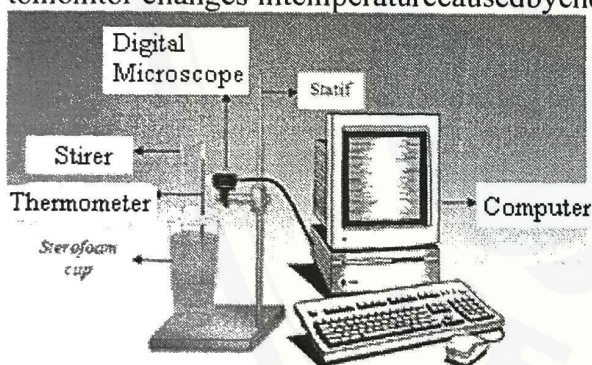


Fig. 1. Simple Calorimeter with digital microscope configuration

Calorimeter Design with Digital Microscope.

Digital video retrieval is done by recording the video from a digital microscope that faced the thermometer in the calorimeter for reading temperature. Then the video is processed with LabVIEW 8.6 software program. This study used a line profile which produces graphs that provide the relationship between time (x-axis) with the RGB value (y-axis). Measurements were made by drawing a line on the picture of fluid (red color) on the thermometer to calculate the number of pixels on the long A and B, as shown in Figure 2. Changes of temperature are visible on the screen that can be determined by the relationship:

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$$\text{Temperature} = 25^{\circ}\text{C} + \frac{\sum B \text{ piksel}}{\sum A \text{ piksel}} \times 1^{\circ}\text{C}$$

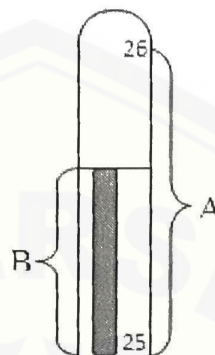


Fig2. reading of temperaturescale

Description:

A=Number of pixels that have been determined

B=Number of pixelsareread

Determination of Cp Calorimeter.

Determination of Cp calorimeter is used to compute the value of the heat capacity of the calorimeter apparatus. Values Cp of calorimeter measurement follow in this procedure as: 50.0 mL of distilled water is incorporated into the styrofoam cup. Click the Run button to start recording, then immediately add 50.0 mL of distilled water that has been heated to a fixed high temperature (1°C). Recording of temperature stops automatically, then the initial trial can be terminated by pressing the stop button. Recorded data was analyzed using LabView 8.6 TM software to determine the value of initial temperature and final temperature.

Calorimeter specific heat can be determined by the formula:

$$C_{cal} = \frac{m_{hot,wt} \times c_{wt} \times (T_{hot,initial} - T_{final}) - m_{col,wt} \times c_{wt} \times (T_{final} - T_{col,init})}{(T_{final} - T_{col,init})}$$

Testing of Feasibility of Calorimeter

A total of 50.0 mL of HCl solution is incorporated into the styrofoam cup. Click the Run button to start recording the temperature of HCl, then immediately make the addition of

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50.0mL of NaOH solution to the Styrofoam cup, before NaOH solution was measured at a temperature of 25 ° C, then the solution was stirred with a stirrer. Results of the recording will stop automatically and can be terminated early experiments. Recorded data was analyzed using LabView software 8.6 TM to determine the initial temperature and the final temperature. Repetitions were performed 3 times for measurement of temperature of solution reaction with various concentrations of 0.15 and 0.10 M. Measurements were also made to the reaction solution of NaOH solution with NH₄Cl and HCl with NH₄OH with various concentrations of 0.15 and 0.10 M. Reaction enthalpy values can be calculated using the equation:

$$\Delta H = - \left[(m_{\text{sol}} \times c_{\text{solvent}} \times \int_{T_1}^{T_2} dT) + \int_{T_1}^{T_2} C_{\text{cal}} dT \right]$$

Determination of Neutralization enthalpy with Hess's Law.

Determination of reaction enthalpy can also be done by combining the standard enthalpy of reaction-individual reactions using Hess's Law. Heat of reaction only depends on the initial state (reactants) and final state (products). It does not depend on the course of the reaction.

Determination of the reaction enthalpy of compound NH₄Cl is done by combining several reactions. The first reaction of a solution of NaOH(aq) is reacted with HCl(aq) and then give ΔH_1 . The second reaction, solution of NaOH(aq) is reacted with a solution of NH₄Cl(aq) and ΔH_2 determined, then both the value is summed. Enthalpy of reaction of compounds NH₄Cl can also be counted on one stage with a solution of HCl(aq) that is reacted with a solution of NH₄OH(aq) and then ΔH_3 is determined. Thermochemical equation can be seen in Table 1.

Table 1. Thermochemical equation

ΔH	Thermochemical equation	ΔH (kJ/mol)
ΔH_1	$\text{NaOH}(aq) + \text{HCl}(aq) \rightarrow \text{NaCl}(aq) + \text{H}_2\text{O}(l)$	-56,3
ΔH_2	$\text{NaOH}(aq) + \text{NH}_4\text{Cl}(aq) \rightarrow \text{NH}_4\text{OH}(aq) + \text{NaCl}(aq)$	-0,5
ΔH_3	$\text{HCl}(aq) + \text{NH}_4\text{OH}(aq) \rightarrow \text{NH}_4\text{Cl}(aq) + \text{H}_2\text{O}(l)$	-55,8

(Lide, 2004).

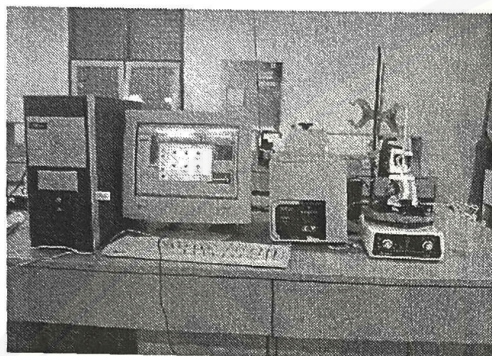
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Discussion

Simple Calorimeter Design is Monitored with Digital Microscope

This research resulted in a simple calorimeter design being monitored by digital microscopy. The calorimeter consists of a series of styrofoam cup, thermometer, digital microscope, stirrer and computers. The one that has been created can be seen in Figure 3.



(a)



(b)

Fig. 3. a set of simple Calorimeter with Digital Microscope: (a) overall of a set of calorimeters and digital microscope (b) a set of calorimeter and digital microscope viewed from side

Programs used in thermometer scale readings is made with Labview 8.6 software. The program featured front-panel and display the block diagram. Front panel show the display of monitor during the process, while the block diagram is a logic function design of work of the program have been made. Display of the front panel and block diagram for analyzing of temperature reading on video can be seen at Figure 4 and 5.

Images captured by a digital microscope are transferred into a Personal Computer (PC) and then stored by the Personal Computer (PC). Video results obtained will be processed by the program LabView TM 8.6 automatically. The result of the video images on the display is drawn by a line so that we get graphs that state relationship of time with the number of pixels.

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The length of the line between A and B in Figure 4 represents the number of pixels generated from the movement of fluid (red color) on the thermometer when the temperature change takes place. The number of pixels in range A-B is inserted into block diagram in program for microscope (Figure 5) and found the number of pixels on the line of A-B (the units of degrees) as much as 447 pixels, so the change of temperature in length can be known the number of pixels.

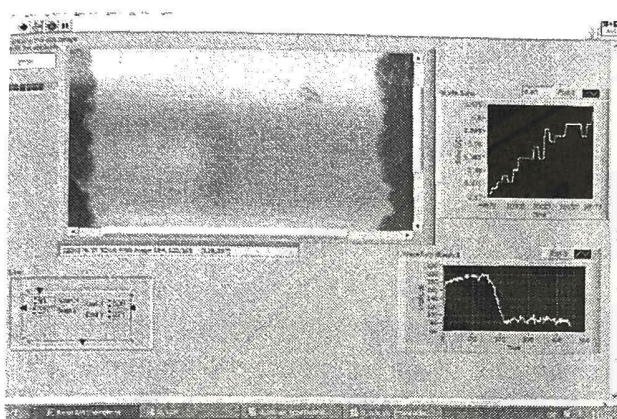


Fig4. display of Frontpanel for reading thermometer scale

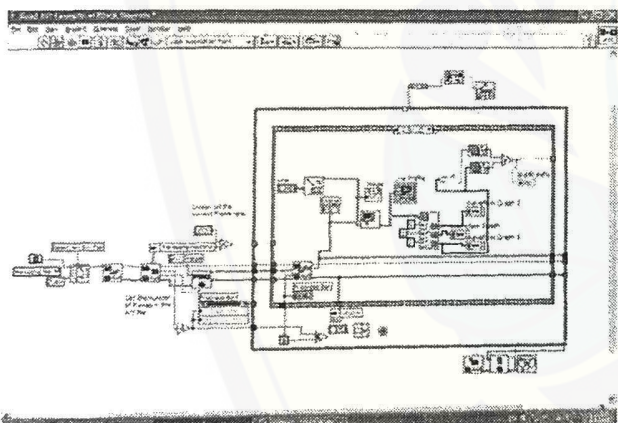


Fig5. Display the block diagram scale reading thermometer

Determination Function Of Temperature Calorimeter C_p .

Heat capacity at constant pressure (C_p) is used to find the value of the heat of absorption of calorimeter. Heat capacity will be used to connect the enthalpy changes with temperature changes. The results of the graph in Figure 6 show that C_p is a function of temperature. It means that value C_p change with change of temperature in solution.

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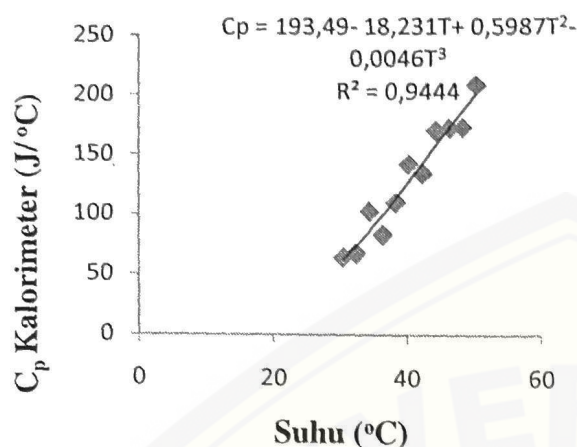


Fig6. Relationship of graph C_p calorimeter with temperature

The results of the graph in Figure 6 show that the equation C_p is a function of temperature. C_p equations used are 3 types of polynomial equations, namely, it can be seen approaching the value of the enthalpy of the test results with the literature value of the enthalpy. This equation shows that the heat capacity of the calorimeter is affected by change of temperature in the measured solution.

Accuracy and Precision of Design of simple Calorimeter with Digital Microscope.

Accurate results is the result of agreement to the true value in a measurement of the quantity (Khopkar, 1990). Determination of accuracy in this study was done by comparing the value of the enthalpy of the test results with the literature value of the enthalpy. Accuracy results between the reaction of NaOH with HCl and HCl reaction with NH_4OH at concentrations of 0.15 and 0.1 M in Tables 2 and 3 show that the results of the accuracy is good. It means that enthalpy value close to the value of the enthalpy of the literature. This result is in contrast to measurements of the reaction of NaOH with NH_4Cl in Tables 2 and 3 which show the results of accuracy is less than the accuracy of the sample reaction with HCl and NaOH reaction of HCl with NH_4OH . Results of this data due to the value of the enthalpy of reaction of NaOH NH_4Cl literature is small that is equal to 0.5 kJ/mol. It means that the heat released is less likely to change of temperature that occurs being very small, so that the reading on the thermometer with a digital microscope is still notable to read the conditions of the enthalpy with values being very small.

Values of accuracy compared with calculations based on the literature at the concentrations of 0.15 and 0.10 M in Tables 4 and 5 show the results of accuracy is less than the value of accuracy in each reaction in Table 2 and 3, it is influenced by the sum which the reaction enthalpy values is far from the literature.

Table 2. Comparison of the accuracy of the enthalpy of a simple calorimeter test results were monitored with a digital microscope with literature at a concentration of 0.15 M.

Sampel	Akurasi
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	(%)
$\text{NaOH}(aq) + \text{HCl}(aq) \rightarrow \text{NaCl}(aq) + \text{H}_2\text{O}(l)$	99,4
$\text{NaOH}(aq) + \text{NH}_4\text{Cl}(aq) \rightarrow \text{NH}_4\text{OH}(aq) + \text{NaCl}(aq)$	6,9
$\text{HCl}(aq) + \text{NH}_4\text{OH}(aq) \rightarrow \text{NH}_4\text{Cl}(aq) + \text{H}_2\text{O}(l)$	99,0

Table3. Comparison of the accuracy of the enthalpy of a simple calorimeter test results were monitored with a digital microscope with literature at a concentration of 0.10M.

Sampel	Akurasi (%)
$\text{NaOH}(aq) + \text{HCl}(aq) \rightarrow \text{NaCl}(aq) + \text{H}_2\text{O}(l)$	98,3
$\text{NaOH}(aq) + \text{NH}_4\text{Cl}(aq) \rightarrow \text{NH}_4\text{OH}(aq) + \text{NaCl}(aq)$	11,5
$\text{HCl}(aq) + \text{NH}_4\text{OH}(aq) \rightarrow \text{NH}_4\text{Cl}(aq) + \text{H}_2\text{O}(l)$	98,0

Data of analysis of precision test samples in Tables 5 and 6 is the coefficient of variation of three repetitions, where K_v values indicate the level of measurement error due to repetition. Precision results obtained at a concentration of 0.15M and 0.10M are below 5% as shown in Table 5 and 6. The results have a high precision level measurement error due to mean little repetition.

Table4. Accuracy results $\Delta H_1 + \Delta H_2$ are compared with ΔH_3

Konsentrasi reaktan	ΔH (kJ/mol)	$\Delta H_1 + \Delta H_2$ (kJ/mol)	Akurasi (%)
0,15 M	-56,37	-49,45	87,7
0,10 M	-54,69	-51,05	93,3

Table5. Precision analysis of data samples at concentrations 0.15M

Sampel	K_v (%)
$\text{NaOH}(aq) + \text{HCl}(aq) \rightarrow \text{NaCl}(aq) + \text{H}_2\text{O}(l)$	1,199
$\text{NaOH}(aq) + \text{NH}_4\text{Cl}(aq) \rightarrow \text{NH}_4\text{OH}(aq) + \text{NaCl}(aq)$	2,993

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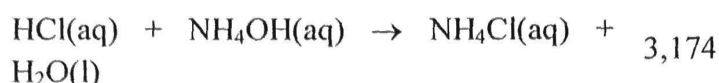


Table 6. Precision analysis of data samples at concentration 0,1 M

Sampel	Kv(%)
$\text{NaOH(aq)} + \text{HCl(aq)} \rightarrow \text{NaCl(aq)} + \text{H}_2\text{O(l)}$	1,602
$\text{NaOH(aq)} + \text{NH}_4\text{Cl(aq)} \rightarrow \text{NH}_4\text{OH(aq)} + \text{NaCl(aq)}$	3,227
$\text{HCl(aq)} + \text{NH}_4\text{OH(aq)} \rightarrow \text{NH}_4\text{Cl(aq)} + \text{H}_2\text{O(l)}$	2,734

Conclusion

Value of resolution for reading temperature on the thermometer in a simple calorimeter that is monitored with a digital microscope is $0,002^\circ\text{C}$, while reading the manual is only $0,5^\circ\text{C}$. Equation C_p obtained by the calorimeters show that C_p is a function of temperature, It means that C_p values change with change of temperature in a solution. Value of accuracy results in a sample has a large enthalpy value obtained at the different values of the accuracy with small enthalpy value that has little accuracy. Accuracy of the test results of the comparison of results with the literature is conducted at concentrations of 0.15M and 0.10M respectively 99.4% and 98.3% for the sample, 6.9% and 11.5% for the sample, and 99, 0% and 98.0% for the sample. Value of precision at a concentration of 0.15M and 0.10M showed Kv values below 5%, so the precision can be said to be good value.

References

- [1] Christian, G.D. 1994. *Analytical Chemistry*. Fifth Edition. Kanada: John Wiley and Sons.
- [2] Khopkar, S.M. 1990. *Konsep Dasar Kimia Analitik*, Penerjemah A. Saptoraharjo. Jakarta: Penerbit Universitas Indonesia (UI-Press).
- [3] Lide, D. R. 2004. *CRC Handbook of Chemistry and Physics*. New York: CRC Press LLC
- [4] Mulyono. 2009. *Membuat Reagen Kimia di Laboratorium*. Jakarta : PT. Bumi Aksara.
- [5] Richner, G., Hungerbuehler, K., & Schenker, B. 2010. *Method and Device for Determining Specific Heat Capacity*. Alexandria: United States Patent.
- [6] Rufiati, E. 2011. *Penentuan Kalor Reaksi*. Surabaya: Unair.
- [7] Sudirham, S., Utari, N. 2010. *Mengenal Sifat-Sifat Material (1)*. Bandung: Darpublic.