10. Important Steps for Writing Research Paper

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1. Selection of Research Topic

Decide your research articles very carefully, considering the length of paper, time required to write research paper, your premeditated audience and the limitation of the resource. During chose your article/paper, you have to make sure large/bulk amount information is available or not on the topic you select. Writing research article will be very simple if you choose a subject that interests you. It will be straightforward later on to constrict the topic. Furthermore, keep away from the sensational and controversial subject that are not too technical and repeat the research method/material [1]. The ultimate aim of selected topic should be helpful for strengthen the society and not dangerous for the living organism.

2. Abstract

An abstract is a short and concise summary of your unpublished/published research paper/experiment work, generally abstract about a paragraph i.e. 150-200 words or 6-7 sentences and abstract are well-written to which provide multiple purposes such as; i. It would be deciding whether to read the full length of paper, ii. It should follow the detailed argument, information and analysis and iii. Abstract helps reviewer/readers bear in mind the key point from your article [2]. Furthermore, abstract includes briefly following steps such as method used, theory, tools, experimental method, finding/result obtained and application of particular method/experiment.

3. Keywords : Keywords are the used to concisely represent the general theme/idea of research paper and also indicate the content of research paper. Let see the example of thermodynamic properties and solution chemistry, the keywords¡ Thermodynamic properties, Solution, Density, ultrasonic velocity, Binary mixture, Ternary mixture, Solution, Partial molar volume, Partial molar compressibility, Acoustic properties etc.
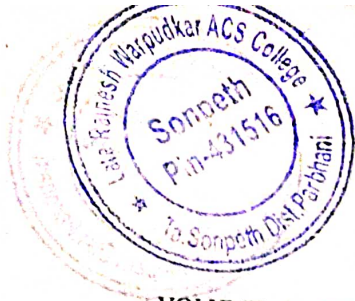
4. Introduction

The introduction provides multiple purposes. It consists of main theme or concept of your studies which expresses your research topic, aim and gives an idea about outline of the research topic/paper. A good quality or impressive introduction will disclose information and give confidence to reader to continue on to main paper such as results finding, methods, theoretical part, experimental part, discussion and conclusion. Introduction describe wide research area, aim, importance/lacking clear motivation, keep it short and giving an overview of the paper [3]. It first portion of manuscript and should present in present tense. Furthermore, abbreviations and explanations are included in this section. Numbers of journals have precise requirement for the introduction in their guideline for authors.

5. Materials

The materials should be written in the past tense, either in active or passive voice. For example, proteinogenic α-amino acids viz. glycine, serine, proline, aspargine monohydrate and arginine all were purchased from HiMedia Laboratories Pvt. Ltd., are used in the present experimental work. The cosolutes disodium tartrate dehydrate, Lactose and non-steroidal anti-inflammatory acetylsalicylic acid drug were used.

6. Methods

The methods should be written in the past tense, either in active or passive voice. For example this part of the chapter represents experimental methods performed in the present study of volumetric, acoustical and optical properties of amino acid in aqueous solution of cosolute were studied. Density measurement is one of the well recognized thermodynamic properties to study the molecular interaction in binary and ternary solution mixture. The densities of α-amino acids in aqueous solutions of different solvent have been measured using standard graduated pycnometer having a bulb volume of ~10 cm^3 as described elsewhere [4]. The pycnometer, with graduated marks, had a standardized bore and closed by well-fitting Teflon white cap. The uncertainty in density measurement was within ±0.08 kg·m^{-3}. Density measurements were carried out in triplicate for each solution and average of the three readings were considered.

The calibration of pycnometer at the respective studied temperatures was done using triple distilled water. The calibrated pycnometer along with solutions was kept in thermally controlled thermostat for 15 minutes each time to achieve the thermal equilibrium and then
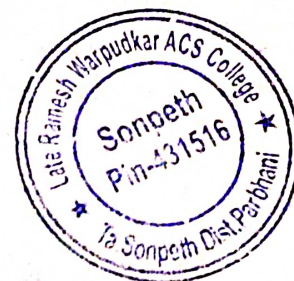
removed. Average means of three weights were measured for the density calculation. The uncertainty in temperature of thermostat was controlled within ±0.1 K·

6. Experimental set

The measurement of ultrasonic velocities is an important tool to understand the molecular interactions of solvent and different solution mixture [5]. Therefore, it is widely used to investigate the interactions in the solutions mixture which include biological compound such as amino acids, peptide, drugs, polymer, milk, oil and sugar. The different types of interactions depend upon the structure of solute and nature of solvent [6]. Many researchers have measured the ultrasonic velocity of water more accurately [7].

The ultrasonic velocities of solution were measured using a quartz crystal ultrasonic interferometer (M-F05, Mittal Enterprises) having stainless steel sample cell with digital micrometer at operating frequency 2 ± 0.0001 MHz. Different part of interferrometer is shown in Figurre 6.1. During the experimental work number of precauation were taken .

7. Calculation

The densities of studied α-amino acids in different aqueous cosolute solutions have measured using standard graduated pycnometer. Density of α-amino acids solutions are calculated by using relation (1) and (2)

$$\rho_s = (w_s / w_w) \times \rho_w \qquad (1)$$

$$\rho_s = m_s / V_w \qquad (2)$$

Where, ρ_s is density of α-amino acids solution, w_s is weight of solution (g) at given temperature, w_w is weight of water (g), ρ_w is density of water (g·cm^{-3}) and V_w is volume of water filling Pycnometer
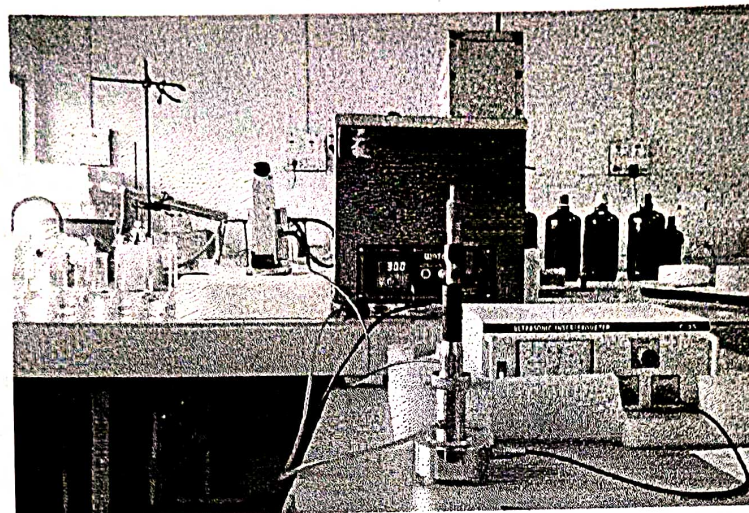
Figure 7.1 Ultrasonic interferrometer and its measuring cell showing different parts

Isentropic compressibility κ_s is computed from experimental density and ultrasonic velocity [8] using Newton-Laplace's relation (3)

$$\kappa_0 = \frac{1}{u_0^2 \rho_0} \tag{3}$$

For solvent and solvent mixture, the isentropic compressibility is

$$\kappa_0 = \frac{1}{u_0^2 \rho_0} \tag{4}$$

Where, ρ_0 is density of solvent and ρ is density of solution (kg·m^{-3}), u_o is ultrasonic velocity of solvent and u is ultrasonic velocity of solution (m·s^{-1}), κ_s and κ_{s0} are isentropic compressibilities of solution and solvent respectively (Pa^{-1}).

8. Graphical analysis

The ideal graphical presentation/abstract should be self-explanatory. The reader/reviewer should quickly understand it and be able to decide whether to read your paper or not.

9. Result and discussion

The result section containing a gives a brief report of main finding of research carried out, whereas the discussion part interpretation/analysis of the result for the reader and disclose the significant importance of the finding. It may include analysis of your experimental, tabulated, graphical, and theoretical and calculation part. We have provided directions to create a concise and acutely informative results and discussion section.

10. Acknowledgement

Most of academic research papers have many people who have helped directly and indirectly in some way in doing the experiment, checking the manuscript, chemical need, referencing, and construction of words/checking the grammar and written the version. Further someone who have helped in sponsoring institution, a funding body such as UGC, DST, ICAR etc., or family/colleague who have helped in the preparation.

11. Reference

Writing the appropriate and accurate references is important aspects of preparing a paper for publication or any kind of evaluation. The format of the references is different as for as Internationals research journals are concerned

Let see the few example

Journal of molecular liquid; Elsevier

1. A.D. Arsule, R.T. Sawale, S.D. Deosarkar, Temperature-dependent volumetric and ultraacoustic studies of α-amino acids in aqueous acetylsalicylic acid drug solutions, J. Mol. Liq. 275 (2019) 478–490, https://doi.org/10.1016/j.molliq.2018.10.122

Journal of Solution chemistry; Springer

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