Responds to Reviewers

Dear Prof. Mirjana Kijevcanin

Greetings, Please find below our detailed answers to Reviewers comments in connection with our submitted manuscript.

TITLE

1.Title can be as following: Density, Viscosity, Ultrasonic sound and excess thermodynamic parameters of ternary liquid mixtures of morpholine + 1,4-dioxane + toluene or nitrobenzene at  308.15K.

Reply: The title of our paper has been changed as per the suggestion of the Reviewer

 INTRODUCTION
 2.Please, see the previous suggestions for Introduction. Some corrections suggested in previous revision are still not considered:

Reply: Changes to the introduction have been done in line with current and previous reviewer’s suggestion.

Introduction should include a brief explanation about:     The importance of measured thermodynamic properties – authors already gave this information.

The brief explanation about the application of investigated chemicals authors already gave this information.

 The brief explanation about where the mixtures of morpholine + 1,4-dioxane + toluene or nitrobenzene could be applied

Reply: The considered chemicals morpholine, 1,4-dioxane, toluene and nitrobenzene in our current investigation have applications in different fields, such as pharmaceutical, metallurgy, polymer, petrochemical and electronic industries. The molecular interactions influence densities, velocities, ultrasonic velocities and other thermodynamic properties. The investigation of their ternary mixture assumes greater significance as it gives clues about more intricate molecular interactions existing in real time applications.

why the mixtures of these particular components are chosen for measurement of its thermodynamic properties – this information is lacking in current Introduction.

Reply: The reviewer’s suggestions is duly acknowledged and the missing information as cited by the reviewer is addressed in the last paragraph of the introduction part.

The information regarding measured and calculated properties of two ternary mixtures – this information is missing in current Introduction.

Reply: The reviewer’s suggestion is duly acknowledged and the missing information as cited by the reviewer is addressed in the last paragraph of the introduction part.

 EXPERIMENTAL SECTION

 3. From the previous review the answer is not given for the following:
 Experimental section: purity of each chemical, stated by producers, should be given in percents; some purification methods were used to additionally purify chemicals, so the final purity should also be reported along with the method of its determination. Authors should state the purity for all chemicals given by the producer as well as purities measured after the purification (if applicable). It can be given in the form of table.

Reply: The experimental section has been modified and the error in reference as pointed by the reviewer has been rectified. The chemicals were not synthesised but directly purchased from the producers (purity 99%) hence the determination of purity of used chemicals were subjected to double distillation techniques becomes less significant. Hence the techniques to ascertain purity are not attempted but the measured densities, viscosities and ultrasonic velocities were confirmed by comparing with earlier literature reports (Table I).

 RESULTS AND DISCUSSION

4.  The changes for Results section are hard to follow – it is suggested that authors answer on each comment from the previous revision in the form of Response to Reviewers (current answers are not detailed enough). It should be answered which references are removed, the list of added references should be given in response (by listing the numbers of references here in answers). And all answers should be given for each comment from the previous revision.

Detailed Response to Reviewers from the previous revision

1. In Results section the uncertainty of the measured properties should be stated;

Response: The uncertainty in measurements have been given in the experimental section.

1. more literature should be introduced for comparison of experimental data with literature data (if applicable);

Response: additional references have been added for comparing the data’s with earlier literature data’s.

1. in reference 22 I don’t see the equation (3) – it should be verified;

Response: The correct reference (No 26) for equation 3 is given.

1. brackets should be checked in equation (6);

response: Extra bracket in equation (6) has been removed as per the suggestion

1. In equation (12) binary contributions are missing – the equation should be verified;

Reply: The equation no12 corresponds to the binary contributions to the currently employed ternary equation.

1. line 160 – reference 27 should be checked if it corresponds to the sentence;

Reply: The suitable reference for the line 160 has been added.

1. in line 176 reference 29 is cited but it doesn’t contain the data for viscosity – it should be verified;

Reply: The cited reference has been changed.

1. when authors are explaining the interaction based on the calculated thermodynamic properties they should emphasized that it is just assumption about interactions – to claim with such certainty (as authors are claiming in this manuscript) some additional analytical methods should support those claims;

Reply: We agree with the reviewers suggestions regarding our discussions about the possible interactions based only on thermodynamic properties. Currently we rectified it and accordingly corresponding changes in the discussion part is carried out.

1. line 204 – what exactly is cited with reference 32 - it should be verified

Reply: The cited reference has been removed as it has occurred erroneously.

1. List of added references:
2. Jörg Fabri, Ulrich Graeser, A. Thomas. Simo Toluene Ullmann's Encyclopedia of Industrial Chemistry. *Weinheim, Wiley*
3. A . Rose venis, X .Rosario Rajkumar , *Oriental Journal of Chemistry .*27

( 2011) 105

1. C.Pettennati, P. Alessi, M. Fermeglia, I. Kikic, *Themochimica Acta*. 162 (1990) 203.
2. S. Martin Contreras, *J Chem Engg Data*. 46 (2001) 1149.
3. S. Pandharinath Nikam, S. Bapu Jagdale, B. Arun Sawant , Mehdi Hasan. *J.Chem. Engg Data*. 45 (2000) 559.
4. Amalendu Pal, Harish Kumar, Bhupinder Kumar, Rekha Gaba, *J Mol Liq.* 10 (2013) 3932.
5. J. Shulka, S. Walker and Warren. *J Chem Soc Faraday Trans*. 1 (1978) 74
6. Ali, A., Nain, A., K., Chand, D., Lal, B. Indian. J .Chem*.* 44A (2005) 51.

List of removed references:

1. R.J. Fort, W. R. Moore. Trans Faraday Soc. 61 (1965) 2102.
2. Manapragafa, V. Rathnam, Sudhir Mohite, Manapragada . S. Kumar . J.serb. Chem .Soc. 77 (2012) 507.
3. L.Mosterio, L.M. Caras and J.L.Legido.J. Chem. Hermodynamics. 41 (2009) 695.

CONCLUSION:

 As in the previous
 revision again it is recommended to reformulate the conclusions regarding molecular interactions. The sentence: “The calculated values of thermodynamic 226 parameters clearly show the existence of strong intermolecular interactions in Morpholine 227 + 1,4-dioxane + nitrobenzene than morpholine + 1,4- dioxane + toluene.” cannot be stated unless FTIR is performed and indicate hydrogen bonding. It can be said for example: according to the calculated properties it can be assumed that strong molecular interactions contribute to the sign of the excess property. Also, the brief explanation about geometrical effects should be included in discussion and conclusions as well.

Reply: Now we have reformulated the conclusions about the possible interactions in a manner such that it is based only on thermodynamic properties as per reviewer’s suggestion. Hence FT-IR is not performed. A brief explanation about the geometrical effects has also been included in discussion and conclusion section by accepting the reviewer’s suggestion.