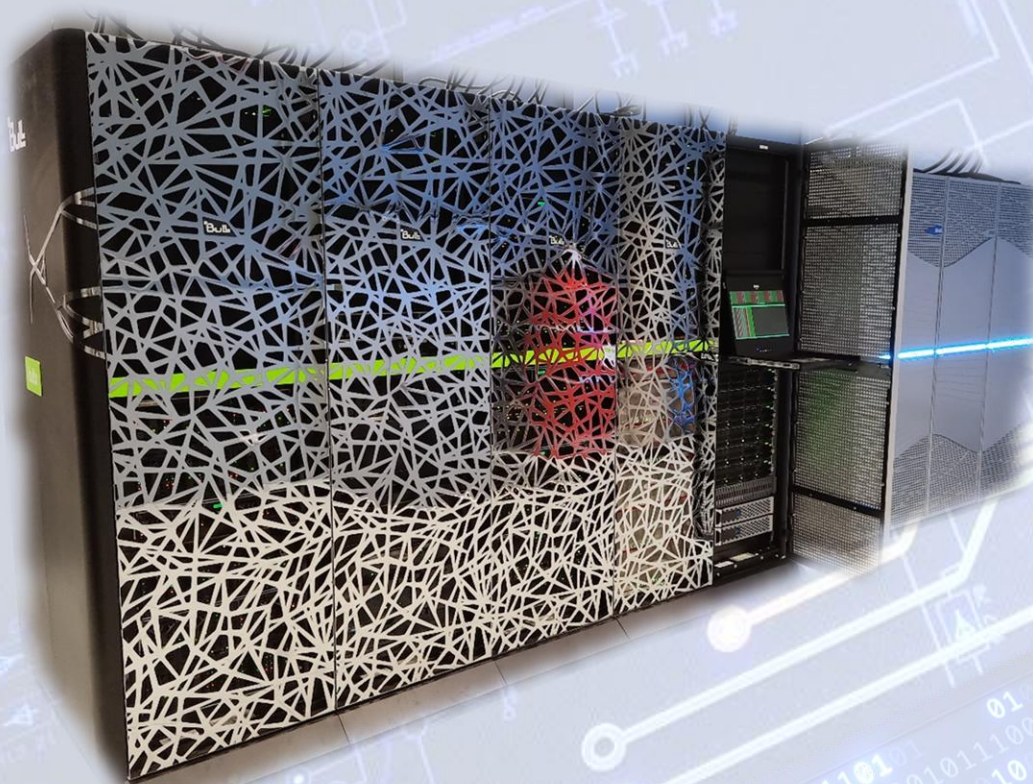




3RD EUROCC VILNIUS WORKSHOP ON USING HPC



Abstract book

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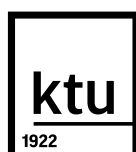
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Peptide in Ionic Liquid Mixtures with Water – Theoretical Study of Structure and NMR spectra

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Ionic liquids (ILs) have been known as “green” and biocompatible solvents for quite some time and some of their possible biological uses include changing catalytic activity of enzymes, stabilizing or destabilizing various proteins, as well as making them permeate more easily through membranes [1]. The nature of ILs and proteins interactions varies and is difficult to evaluate, so smaller peptides are often used as a model system to discover how different ILs interact with said peptides and change their structure in the aqueous solution. The method most suited for recognizing intermolecular interactions is nuclear magnetic resonance (NMR) spectroscopy as atoms, especially hydrogen, chemical shift is very sensitive to changes of central molecule’s close environment.

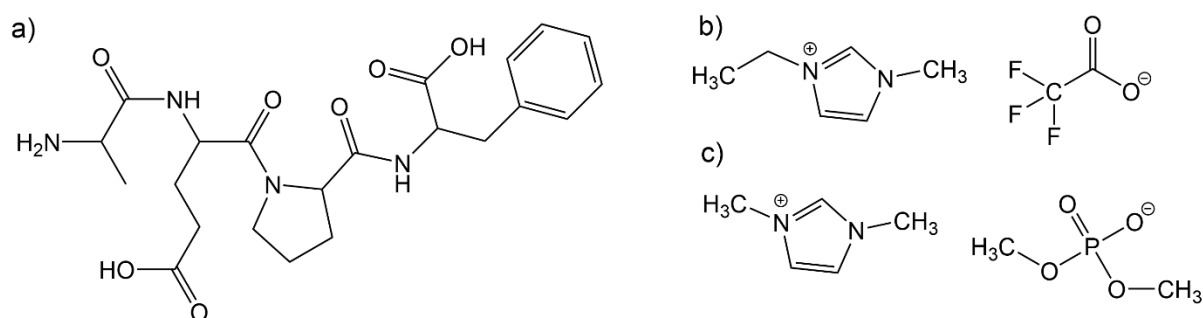


Fig. 1. Structural formulas of a) peptide Ala-Glu-Pro-Phe, b) ethyl-3-methylimidazolium trifluoroacetate, c) 1,3-dimethylimidazolium dimethyl phosphate.

In this work an Ala-Glu-Pro-Phe tetrapeptide was investigated using molecular dynamics (MD) simulations and quantum mechanics/molecular mechanics calculations, while in an aqueous environment and in IL/water mixture. Two ILs were chosen, both with popular imidazolium cations – ethyl-3-methylimidazolium trifluoroacetate ([Emim][TFA]) and 1,3-dimethylimidazolium dimethyl phosphate ([Mmim][DMP]). Theoretically computed chemical shift differences of peptide’s hydrogen atoms were compared to experimental results [2] allowing us to evaluate the different interactions taking place in peptide/IL/water systems, while MD simulation data revealed some structural changes in the peptide’s structure itself.

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REFERENCES

- [1] Gomes, J. M., Silva, S. S. & Reis, R. L. Biocompatible ionic liquids: fundamental behaviours and applications. *Chemical Society Reviews* **48**, 4317–4335 (2019)
- [2] Richardt, A., Mrestani-Klaus, C. & Bordusa, F. Impact of ionic liquids on the structure of peptides proved by HR-MAS NMR spectroscopy. *Journal of Molecular Liquids* **192**, 9–18 (2014).