

Electrochemical effect of tetraphenylporphyrin addition to ionic liquid on Bi(111)

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Ionic Liquids (ILs) are salts that are liquid at room temperature. ILs have high viscosity and low vapour pressure. ILs allow to achieve wide potential ranges that are inaccessible for aqueous electrolytes¹. In electrochemistry, ILs are applied as electrolytes in batteries, supercapacitors and electrodeposition². Porphyrins are easily modifiable and have a lot of variations. Thus, they are useful for studying the balance of various interactions at electrode surfaces that determine the interfacial properties³. Porphyrins have been applied in energy conversion systems, including photovoltaics, photocatalysts and energy storage systems⁴. Porphyrins have also been used in a variety of diagnostic tools and treatment modalities⁵. The adsorption of organic molecules from ILs has not been studied as much as in aqueous and other solutions.

In this presentation, the adsorption of tetraphenylporphyrin (TPP) was studied in IL+TPP mixture using a Bi(111) electrode. The focus is on cyclic voltammetry and electrochemical impedance spectroscopy results. The respective experimental results for IL+TPP mixture were compared to neat IL data. The analysis of the results shows that the stable potential range (for IL+TPP mixture) was similar to pure IL. This gives an indication that TPP does not affect the stability of the electrolyte | electrode system. In the region of more positive potentials, the possible surface oxidation processes of the Bi electrode took place. Followed by the possible formation of bismuth ion TPP complex. In the range of more negative potentials, the increase in current values is related to impurities or water residue in the IL+TPP mixture.

Acknowledgements

This work was supported by the Estonian Research Council Grants PSG249 and PRG676, by the EU through the European Regional Development Fund Project TK141 (2014-2020.4.01.15-0011), by the Estonian Ministry of Education and Research (TK210), and by the project “Increasing the knowledge intensity of Ida-Viru entrepreneurship” (ÕÜF12) co-funded by the European Union.

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