INTERFACIAL STABILITY OF BISMUTH SINGLE CRYSTAL PLANES IN IONIC LIQUID MEDIA: AN *IN SITU* SCANNING TUNNELING PERSPECTIVE

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The surface structure of metal electrodes plays a decisive role in many electrochemical processes, particularly in electrocatalysis. In liquid media, the stability of metal electrodes is achieved *via* the formation of the electrical double layer (edl). Contributing to the formation of the edl, halide ions may promote restructuring of the electrode surface. Considering that there is limited understanding of the interactions at metal | ionic liquid interfaces, it is necessary to study how the stability of metal electrodes with varying metallic properties is influenced by a pure halide ionic liquid environment [1]. To assess the electrochemical stability of bismuth single crystal electrode planes with varying degree of metallicity in ionic liquid media, we investigated Bi(111), Bi(001) and Bi(01$\bar{1}$) in 1-propyl-3-methylimidazolium ionic liquid (PMImI) under electrochemical polarization conditions using electrochemical scanning tunneling microcopy method (*in situ* STM). No potential-induced surface reconstruction phenomena could be inferred from prior study that focused on surface-averaging electrochemical methods, such as cyclic voltammetry and electrochemical impedance spectroscopy [2]. Dynamic *in situ* STM measurements, however, revealed the potential-induced surface reconstruction of the Bi(001) and Bi(01$\bar{1}$) planes. Such observation implies that both difference in metallic properties of single crystal electrode plane and potential-dependent nature of iodide ion adsorption play a fundamental role in the structure and stability of the electrode surface. Thus, this study signifies the importance of using complimentary methods when assessing the stability of single crystal electrodes.

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References

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