Ionovoltaic Device for Monitoring Ion Dynamics in Aqueous-Phase

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Recently, study of ion dynamics at liquid-solid interface within electrical double layer (EDL) has actively progressed. However, a poor understanding of the dynamics by ion diffusion poses challenges regarding monitoring technologies in aqueous-phase. An ionovoltaic device that drives by the ion dynamics converts directly liquid-solid interfacial phenomena into electrical signals without an external bias. Herein, we first introduce the aqueous-soaked ionovoltaic device to monitor various dynamic phenomena in EDL due to the ion diffusion and adsorption. In the aqueous environment, EDL forms at the liquid-solid interface by ion diffusion from ionic droplet of high concentration to bulk deionized water. As the ions diffuse, a potential difference in the semiconductor due to Coulomb interaction between the adsorbed ions and the accumulated electrons produces the electrical signal. Based on Fick's law, we investigated that an output voltage from the ionovoltaic device has a correlation with the various critical factors (ϕ, D, η, T). The results provide a substantial potential to develop methods for monitoring ion adsorption dynamics driven by ion diffusion.