Development of Galvanostatic Fourier Transform Electrochemical Impedance Spectroscopy

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Here we present the recent development of the galvanostatic Fourier transform electrochemical impedance spectroscopy (FTEIS), which monitors impedance of electrochemical reactions controlled by current steps. We first find relevant relations for potential change upon application of a step current, simulate impedance spectra theoretically from the mathematical relations, and verify them with experimental results. The application of the galvanostatic FTEIS technique is demonstrated by measuring impedances of a semiconductive silicon wafer using the conventional frequency response analysis (FRA), the potentiostatic FTEIS and the galvanostatic FTEIS methods, and the results are in excellent agreement with each other. This work is significant in that the galvanostatic FTEIS would allow one to record impedance changes during charge-discharge cycles of secondary batteries and fuel cells as well as electrochemically irreversible systems which may produce noise level chronoamperometric currents by potentiostatic techniques.