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Rapid Electrolytic Conductivity Measurement Sensor JAVAD R. GATABI, Material Science Engineering and Commercialization Department, Texas State University, San Marcos, ZAHRA REZANEJAD, Department of Pharmacy, Mazandaran University of Medical Sciences, Sari, Iran, SAYANTAN DAS, Material Science Engineering and Commercialization Department, Texas State University, San Marcos, M. SOLTANI, Department of Electrical and Computer Engineering, University of Delaware, Newark — Using an AC excitation signal for Electrolytic conductivity (EC) measurement, pose some limitations in cell dimensions and components as well as excitation signal amplitude and frequency. These limitations are applied to minimize the effect of double layer capacitance, Faradaic resistance, and parasitic components to increase the measurement accuracy. It reduces the sensor response time. The low frequency signal (1KHz-5KHz), in the fastest method, requires longer sampling time for sine wave fitting algorithms to estimate the amplitude of the signal. In this paper, the dynamic response of the electrochemical cell is investigated; considering the system equivalent circuit. We propose a novel EC measurement method using three pairs of electrodes, which is designed for fast measurement applications. Three excitation signals with the same frequency and amplitude but different phase are exerted on the electrolyte solution. An analog circuit is employed for fast mathematical calculation to provide an analog output signal, depending on the conductivity of the solution. The fabricated prototype is thousands times faster than traditional sensors in the same frequency range and accuracy.

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