Electronic Supplementary Material (ESI) for Analyst.

Supplementary information

Automated Analysis of Food-borne Pathogens using a Novel Microbial Cell Culture, Sensing and Classification System

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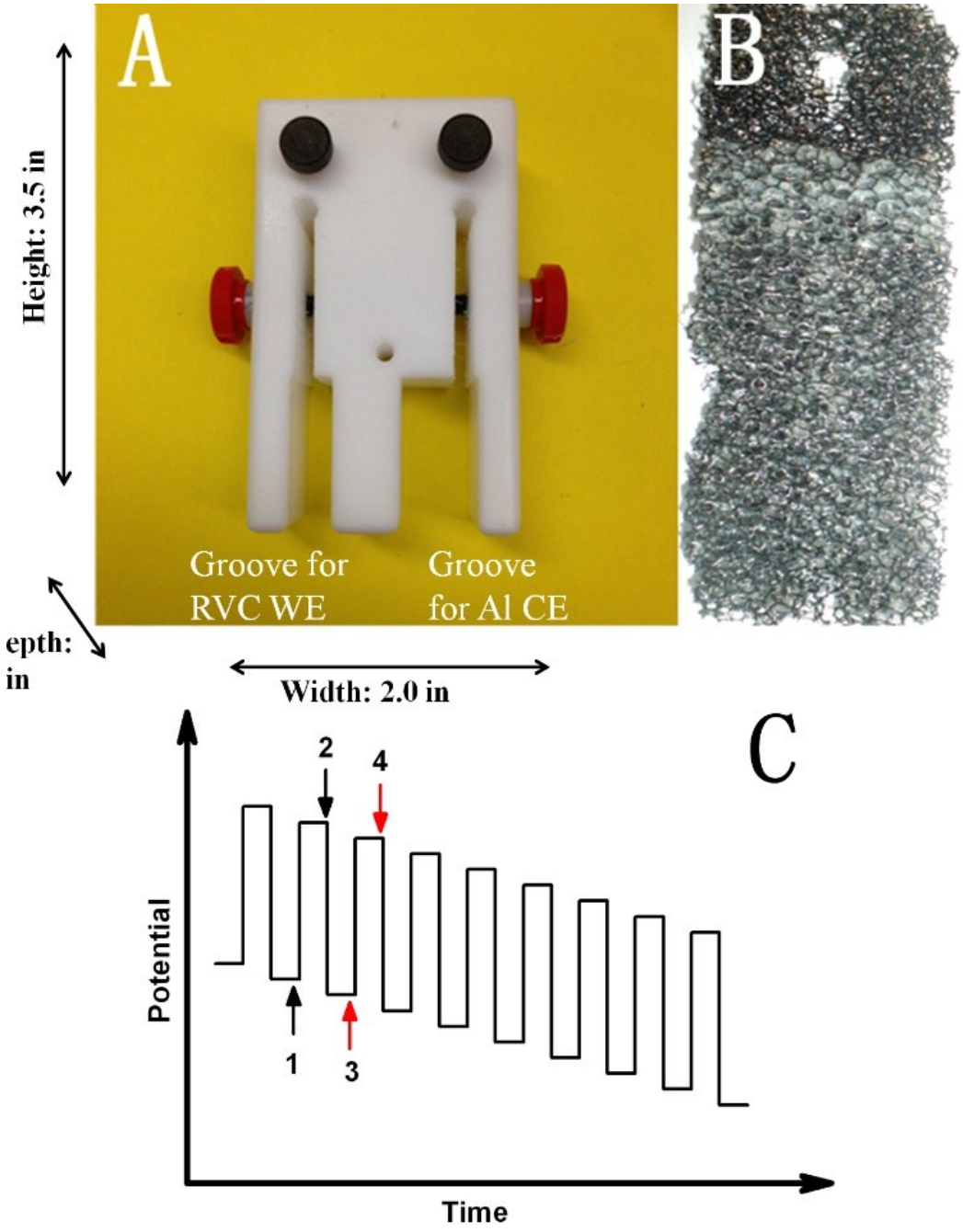

Figure S-1. (A) Sensor platform designs, reticulated vitreous carbons (RVC) applied as working electrodes, Aluminum forms served as counter electrodes. (B) Working electrode, RVC, with biofilm adhered. (C) Applied potential in DPV: the upside arrows indicate the voltages prior to the pulse. The downside arrows indicate the voltages after the pulse. Different colors indicate different pairs. 0.022 V is the voltage difference between 1 & 2 and, 3 & 4 respectively; 0.002 V is the voltage difference between 1 & 3 and 2 & 4 respectively.

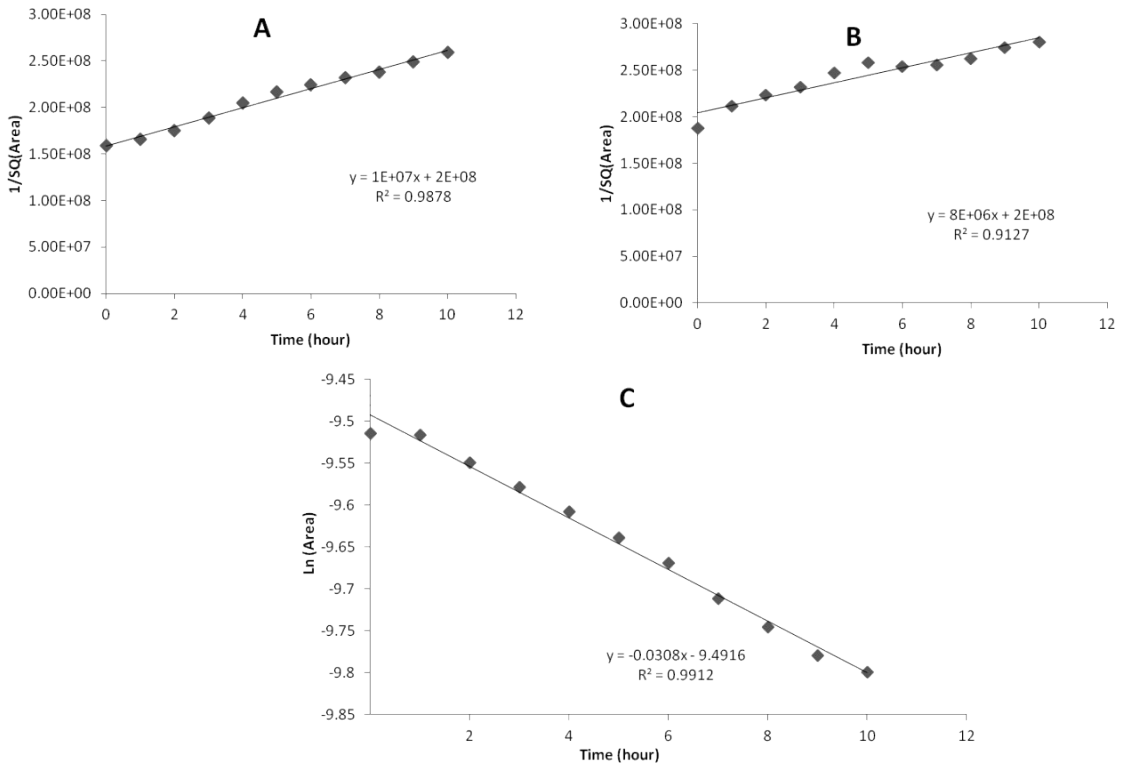

Figure S-2. Kinetic analysis of oxygen peak areas: (A) EC#11775, third order reaction fitting; (B) EC#25922, third order reaction fitting; (C) SE#12228, first order reaction fitting.

Table S-1 Quality control criteria used for data analysis and database development

Parameter	Criteria	Rationale
The sum of squared error to the 6th order polynomial equation	Reject a curve whose sum is higher than 10^{-6}	Rule out noisy curves
Maximum delta current (δi)	Reject a curve with all δi lower than 10^{-5} A	Rule out low flat curves which cannot be analyzed.
Number of rejected DPV curve in a whole data set	Reject a data set contains more than three rejected DPV curves	Rule out data sets have too many error cannot be classified
Initial oxygen peak value	Reject data sets with initial oxygen peak lower than 10^{-4} A	Rule out low initial oxygen samples

Table S-2 Features extraction. Thirty two features derived from the DPV measurements used in AMC[3]. Features 1 to 16 was based on oxygen peak area vs time curves; Features 17 to 32 were based on pathogen peak area vs. time curves.

Feature number	Description of features
Feature 1	The oxygen peak area value of the initial point
Feature 2	Variance of the whole oxygen peak area vs time curve
Feature 3	The hour when the transition point occurred in the oxygen peak area vs time curve
Feature 4	Variance of the flat region in the oxygen peak area vs time curve
Feature 5	Slope of linear regression, for oxygen peak area vs time curve
Feature 6	Intercept of linear regression, for oxygen peak area vs time curve
Feature 7	Standard error of linear regression, for oxygen peak area vs time curve
Feature 8	Polynomial coefficient of x^2 of 2^{nd} order polynomial, for oxygen peak area vs time curve
Feature 9	Polynomial coefficient of x of 2^{nd} order polynomial, for oxygen peak area vs time curve
Feature 10	Intercept of 2^{nd} order polynomial, for oxygen peak area vs time curve
Feature 11	Standard error of 2^{nd} order polynomial, for oxygen peak area vs time curve
Feature 12	Polynomial coefficient of x^3 of 3^{rd} order polynomial, for oxygen peak area vs time curve
Feature 13	Polynomial coefficient of x^2 of 3^{rd} order polynomial, for oxygen peak area vs time curve
Feature 14	Polynomial coefficient of x of 3^{rd} order polynomial, for oxygen peak area vs time curve
Feature 15	Intercept of 3^{rd} order polynomial, for oxygen peak area vs time curve
Feature 16	Standard error of 3^{rd} order polynomial, for oxygen peak area vs time curve
Feature 17	The pathogen peak area value of the initial point
Feature 18	Variance of the whole pathogen peak area vs time curve
Feature 19	The hour when the transition point occurred in the pathogen peak area vs time curve
Feature 20	Variance of the flat region in the pathogen peak area vs time curve
Feature 21	Slope of linear regression, for pathogen peak area vs time

	curve
Feature 22	Intercept of linear regression, for pathogen peak area vs time curve
Feature 23	Standard error of linear regression, for pathogen peak area vs time curve
Feature 24	Polynomial coefficient of x^2 of 2^{nd} order polynomial, for pathogen peak area vs time curve
Feature 25	Polynomial coefficient of x of 2^{nd} order polynomial, for pathogen peak area vs time curve
Feature 26	Intercept of 2^{nd} order polynomial, for pathogen peak area vs time curve
Feature 27	Standard error of 2^{nd} order polynomial, for pathogen peak area vs time curve
Feature 28	Polynomial coefficient of x^3 of 3^{rd} order polynomial, for pathogen peak area vs time curve
Feature 29	Polynomial coefficient of x^2 of 3^{rd} order polynomial, for pathogen peak area vs time curve
Feature 30	Polynomial coefficient of x of 3^{rd} order polynomial, for pathogen peak area vs time curve
Feature 31	Intercept of 3^{rd} order polynomial, for pathogen peak area vs time curve
Feature 32	Standard error of 3^{rd} order polynomial, for pathogen peak area vs time curve