Electronic Supplementary Material (ESI) for Analyst.

Supplementary Information

Oxidation of Hydroxide Ions in Weak Basic Solutions Using Boron-doped Diamond Electrodes: Effect of the Buffer Capacity

Irkham,[1] and Yasuaki Einaga*[1,2]

[1] *Department of Chemistry, Keio University, 3−14−1 Hiyoshi, Yokohama 223−8522, Japan*

[2] *JST-ACCEL, 3−14−1 Hiyoshi, Yokohama 223−8522, Japan*

E-mail: einaga@chem.keio.ac.jp

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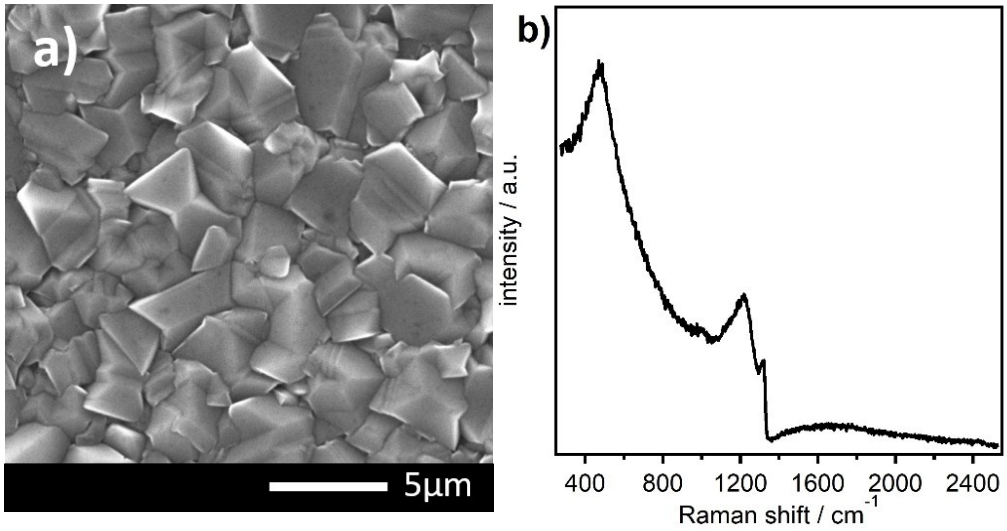

Fig. S1. (a) SEM image and (b) Raman spectrum of 1% BDD used throughout all experiments.

Table S1. Mean, standard deviation (SD), and relative standard deviation (RSD) values of maximum current peak at different pretreatment of BDD in 20 mM H_3PO_4 buffer solution pH 11 (N = 5).

BDD	Peak Current	
	Mean ± SD (µA)	RSD (%)
With AO Pretreatment	134.98 ± 2.40	1.78
With CR Pretreatment	145.52 ± 1.38	0.95
Without Pretreatment	124.94 ± 8.54	6.83

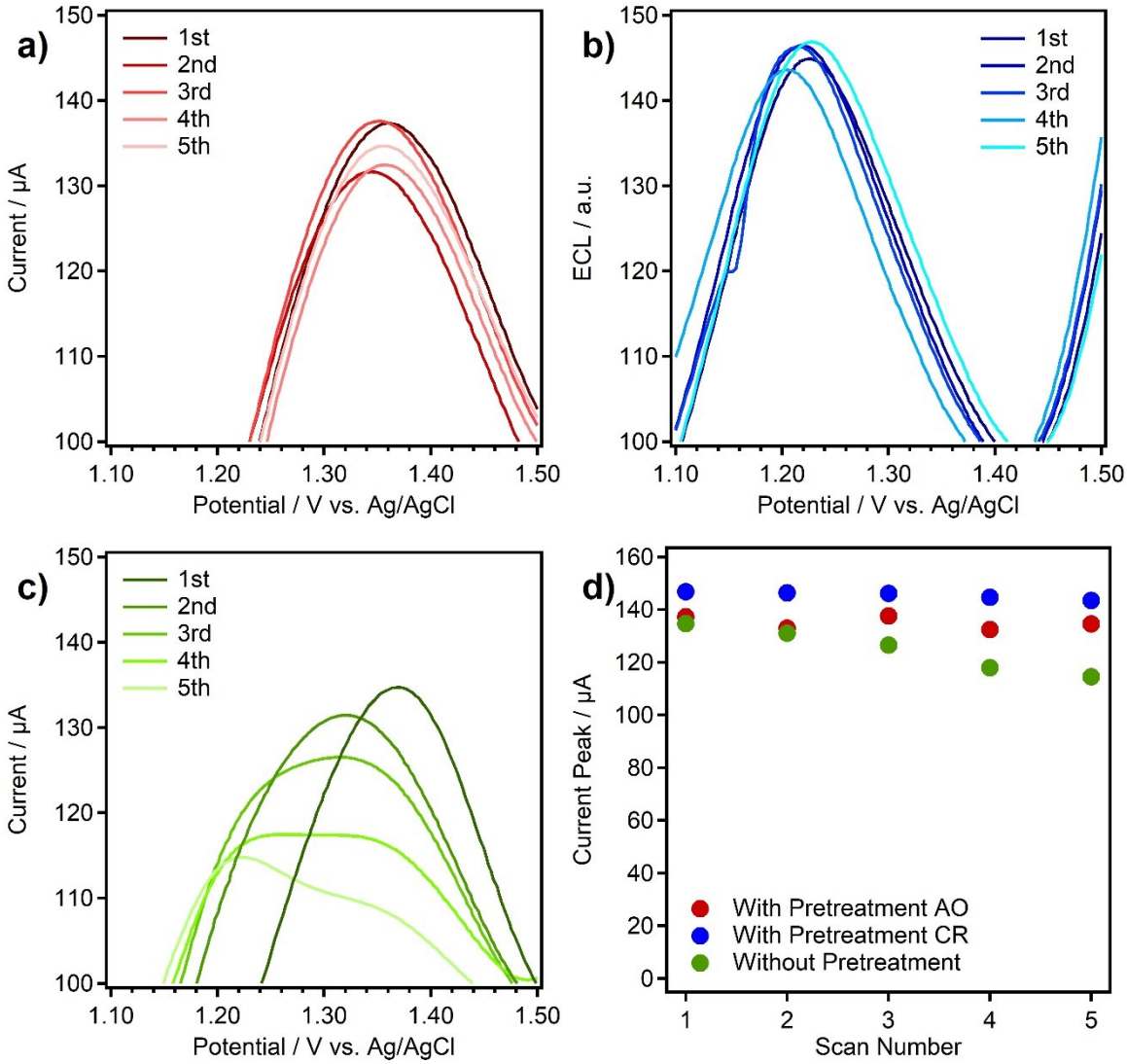

Fig. S2. Consecutive LSVs of 20 mM H_3PO_4 buffer solution pH 11 (a) with AO, (b) CR, (c) without pretreatment. (d) Peak current observed in consecutive LSV measurements with and without pretreatment, respectively. Procedure of "without pretreatment" is "pretreatment−1st scan−2nd scan−3rd scan−4th scan−5th scan", while procedure of "with pretreatment" is "pretreatment−scan−pretreatment−scan−pretreatment−scan−pretreatment−scan−pretreatment−scan". The solutions were fresh in each measurement. The potential was scanned from 0 to 2.0 V with scan rate 20 mV/s.

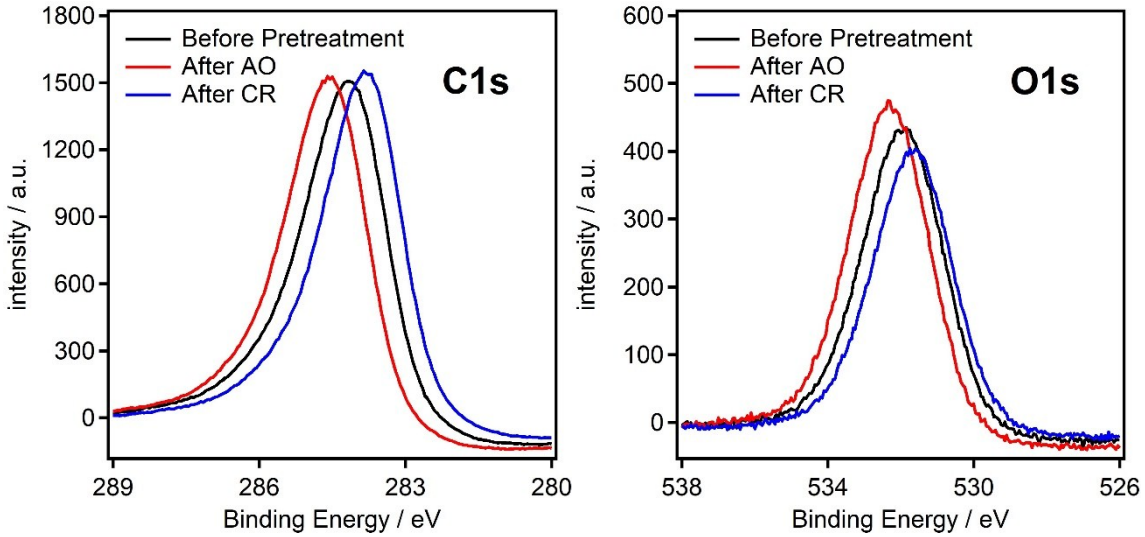

Fig. S3. XPS analysis (C1s and O1s) of BDD before pretreatment, after AO pre-treatment, and after CR pretreatment.

Table S2. Table summarizing the relative abundance of O1s and C1s obtained from XPS measurement for BDD before pretreatment, after AO pretreatment, and after CR pretreatment.

Sample	C 1s (%)	O 1s (%)
Before	87.75	12.25
After AO	86.77	13.23
After CR	89.12	10.88

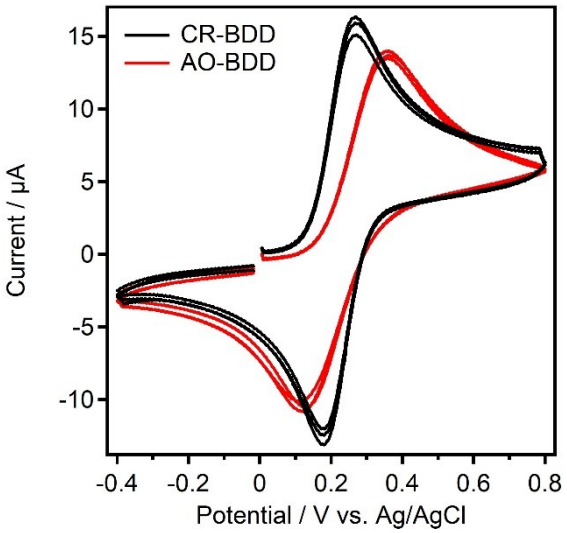

Fig. S4. Cyclic voltammetry of $K_4[Fe(CN)_6]$ in 0.1 M NaClO4 using AO- and CR-BDD. Potential was scanned 0 V to 0.8 V to -0.4 V with scan rate 100 mV/s. Measurement are repeated for 3 times.

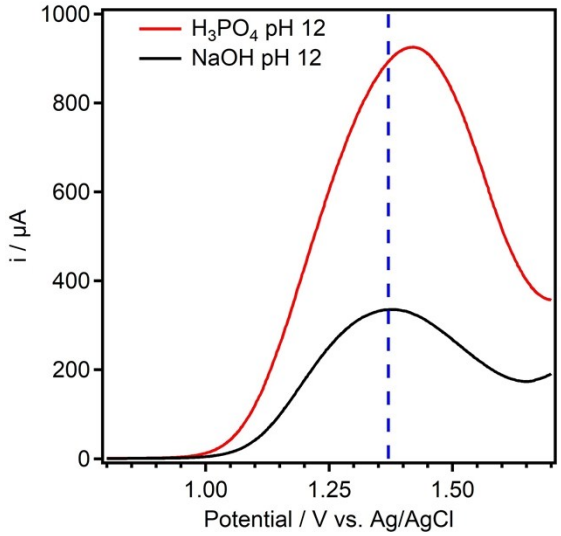

Fig. S5. LSVs comparison of 20 mM H_3PO_4 (red line) and NaOH (black line) at pH 12. Potential was scanned from 0 V to 2.0 V with scan rate 100 mV/s at AO-BDD.

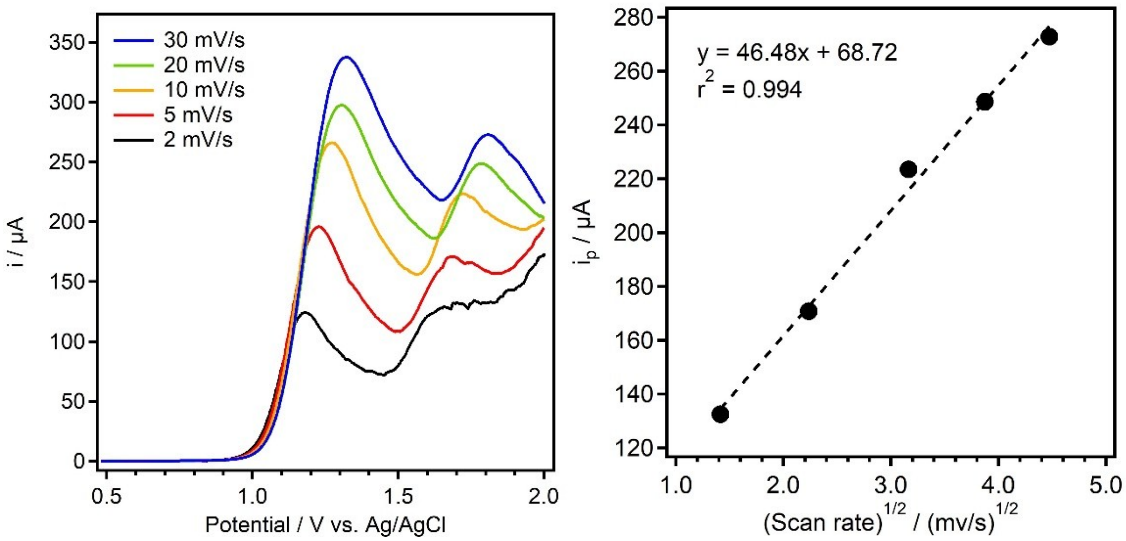

Fig. S6. Left: LSVs at various scan rates of 20 mM H_3PO_4 at pH 11.5 using AO-BDD and 0.3 M $NaClO_4$ as electrolyte. Right: peak current at around 1.75 V as a function of the square root of the scan rate.

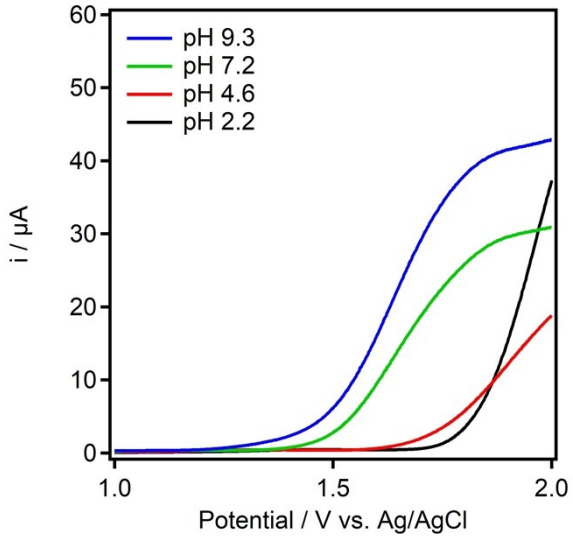

Fig. S7. LSVs for different hydroxide ion concentrations in 20 mM H_3PO_4 buffer solutions with pH ranging from 2.2 to 9.3 at 0.1 M $NaClO_4$ using AO-BDD. The potential was scanned from 0 V to 2.0 V with a scan rate of 20 mV/s

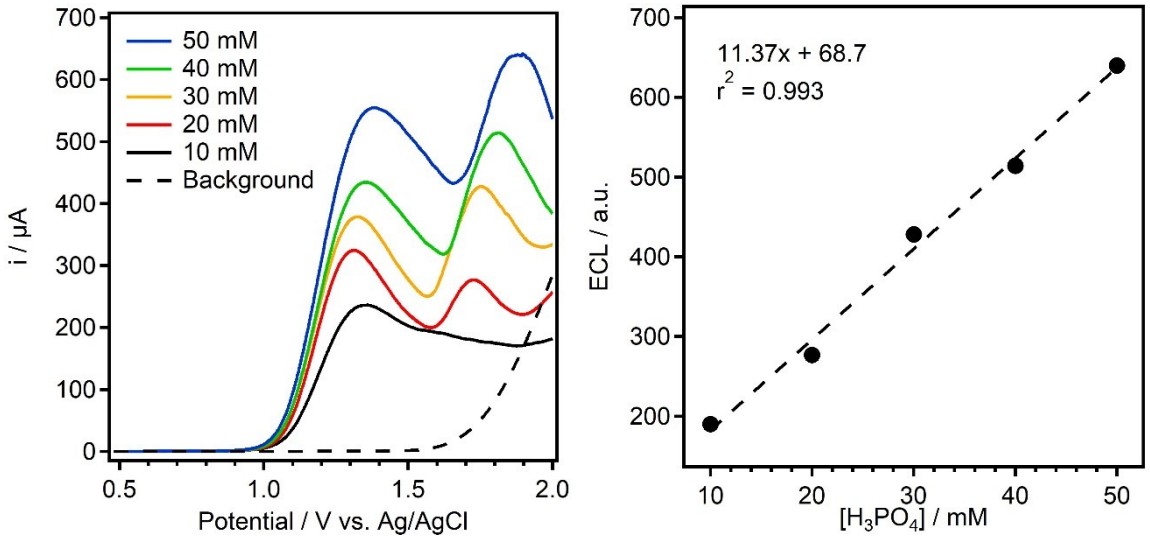

Fig. S8. Left: LSVs for different concentrations of H_3PO_4 solution at pH 11.5 using AO-BDD and 0.3 M $NaClO_4$. Right: peak current at around 1.8 V as a function of phosphate concentration.