—Supplementary Figures—

Electrochemical Oxidation of Monosaccharides at Nanoporous Gold with Controlled Atomic Surface Orientation and Non-enzymatic Galactose Sensing

Yasuhiro Mie *, Shizuka Katagai and Masiki Ikegami

Bioproduction Research Institute, National Institute of Advanced Industrial Science and Technology (AIST), Sapporo 062-8517, Japan; s.katagai@aist.go.jp (S.K.); m.ikegami@aist.go.jp (M.I.)

** Corresponding Author: Yasuhiro Mie*

Phone: +81-11-857-8913, Fax: +81-11-857-8915, Email: yasuhiro.mie@aist.go.jp

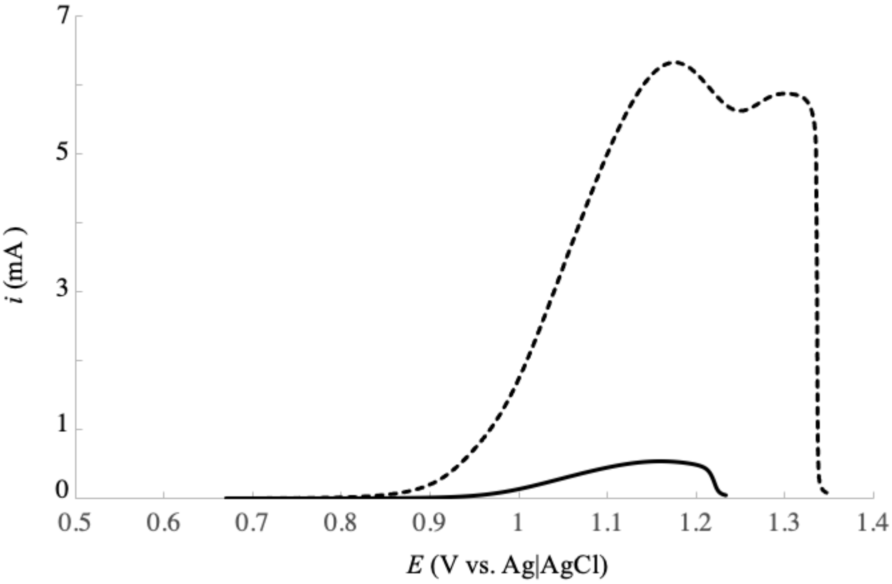


Figure S1. Representative linear sweep voltammograms of gold electrodes in 35 (solid line) and 500 mM (dashed line) HCl solutions at a scan rate of 50 mV s^{-1}. The passivation potentials were approximately 1.335 and 1.220 V in 500 and 35 mM HCl, respectively. Typical anodization was conducted at 1.310 and 1.185 V to prepare NPG-500 and NPG-35 for 1.5–3 min and 10–20 min, respectively.

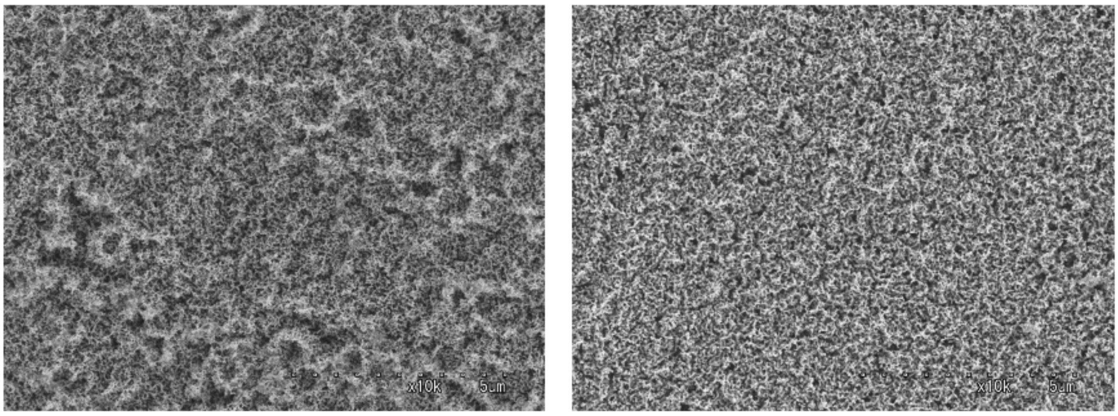


Figure S2. SEM images of NPG-35 (left) and NPG-500 (right) in the 12 × 9.5 μm region.

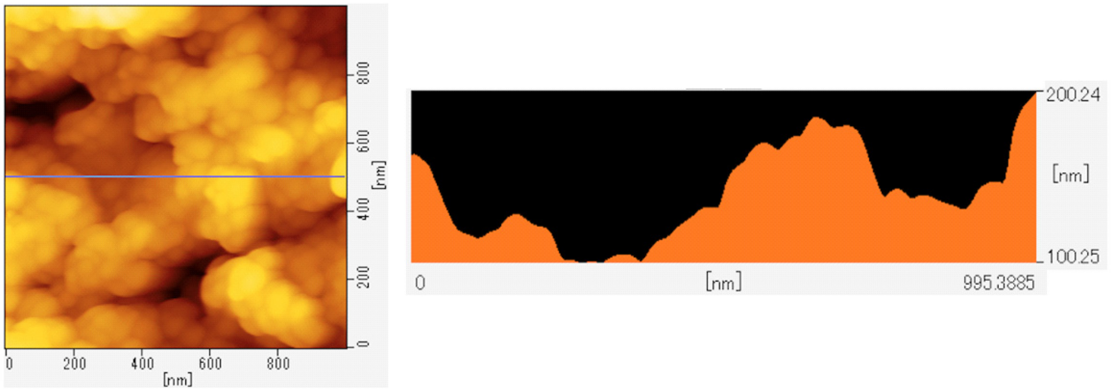
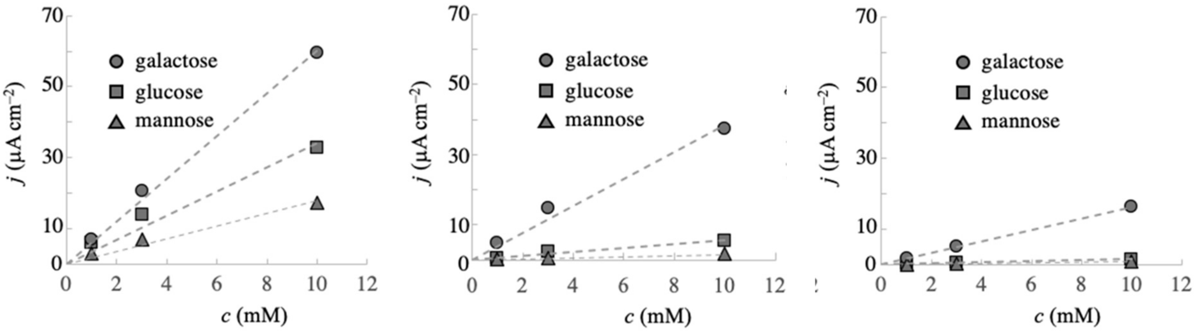


Figure S3. Atomic force microscopy (AFM) images of nanoporous gold (NPG) electrode in the x–y region of 1000 × 1000 nm square (left) and its depth profile (right) at the indicated line in the left image.



(**A**) (**B**) (**C**)

Figure S4. Relationship between saccharide concentration and current density obtained from the voltammograms in Figure 2A, Figure 3B, and Figure 4C, respectively, at –0.2 V. (**A**) and (**B**) were obtained in the absence of NaCl at NPG-500 and NPG-35, respectively, and (**C**) was in the presence of 0.1 M NaCl at NPG-500.

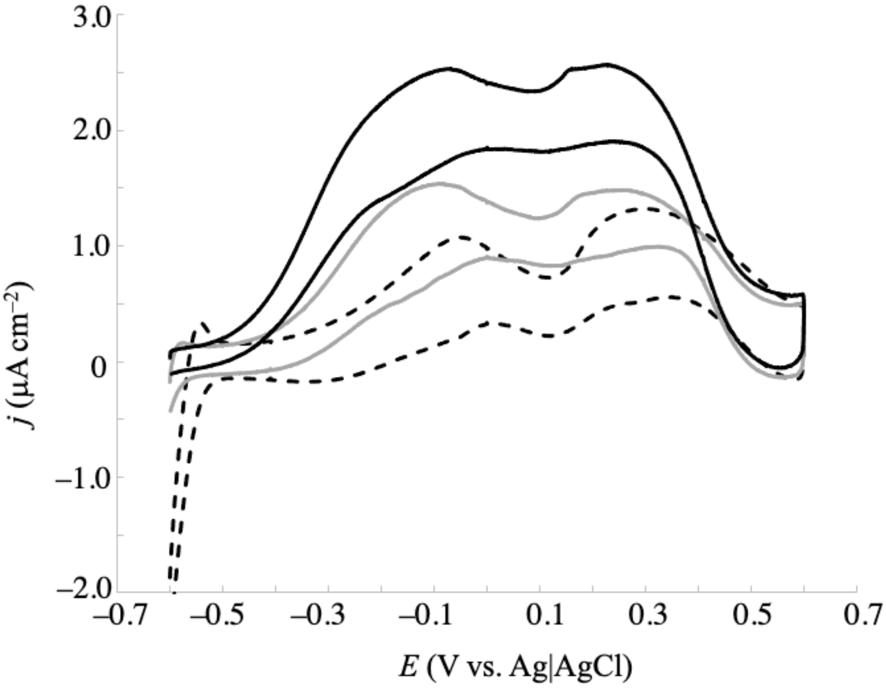


Figure S5. Cyclic voltammograms of NPG-500 in 0.1 M phosphate buffer solution of pH 6.0 (dashed black line), 7.0 (gray solid line), and 8.0 (black solid line) in the presence of 2 mM at galactose at a scan rate of 0.02 V s^{-1}.

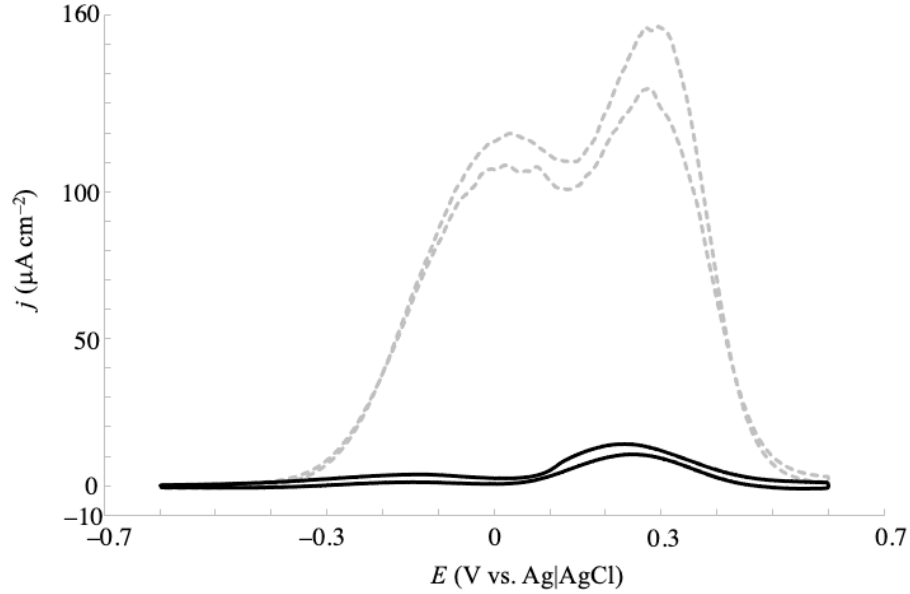


Figure S6. Cyclic voltammograms of 10 mM galactose at NPG-35 in the presence (black solid line) of 0.1 M NaCl in a 0.1 M phosphate buffer solution (pH 7.5) at a scan rate of 0.02 V s^{-1}, together with that in the absence of NaCl (gray dotted line).

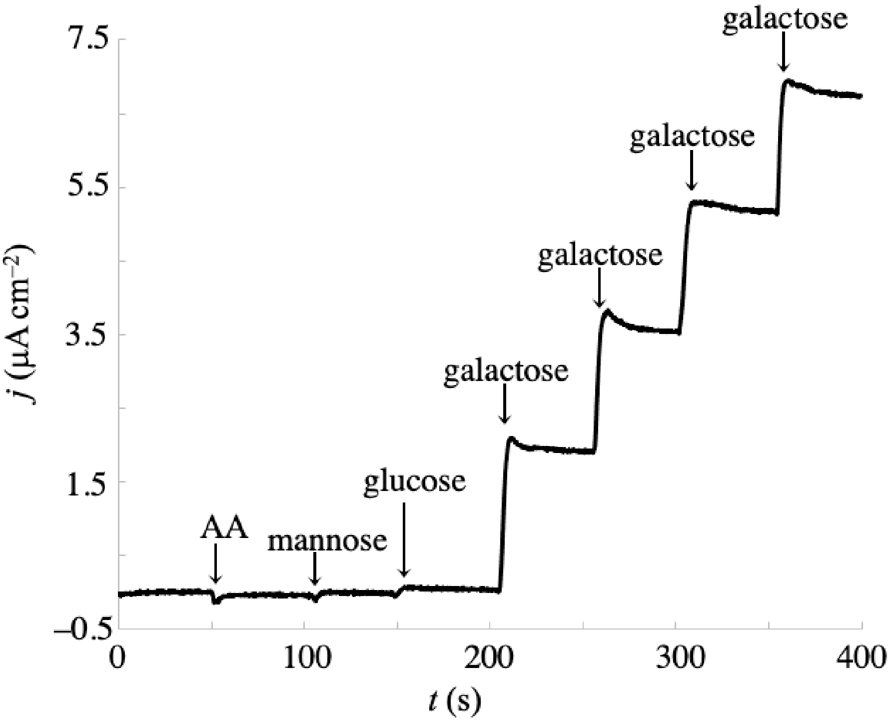
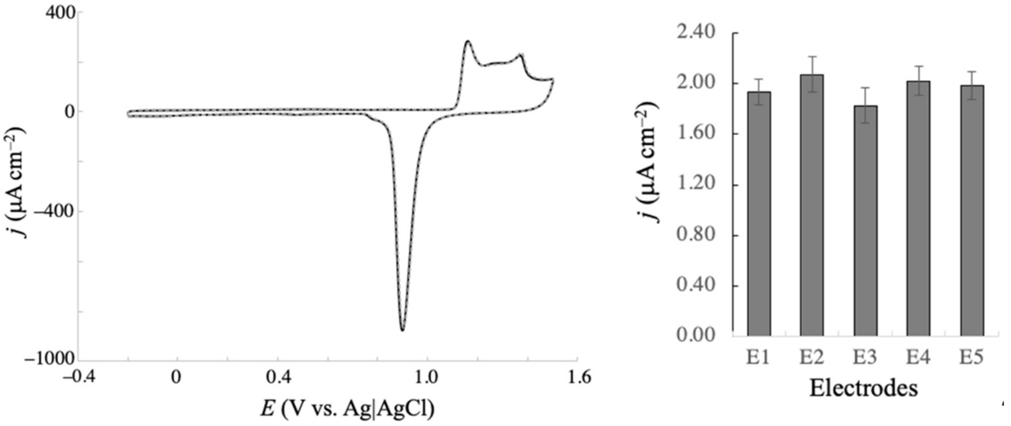


Figure S7. Representative amperogram obtained at −0.1 V in a phosphate buffer (pH 7.5) containing 0.1 M NaCl, with successive additions of 0.2 mM ascorbic acid (AA), 2 mM mannose, 2 mM glucose, and 2 mM galactose at 100 s intervals.



(**A**) (**B**)

Figure S8. (**A**) Cyclic voltammograms of NPG-500 in 0.5 M H_2SO_4 solution before (solid black line) and after (dashed gray line) seven amperometric measurements for galactose at a scan rate of 0.1 V s^{-1}. (**B**) Current densities of five different NPG-500 electrodes by amperometric measurements at –0.1 V in 0.1 M phosphate buffer (pH 7.5) containing 2 mM galactose and 0.1 M NaCl. Each electrode was used for triplicate determinations, and an error bar indicates the standard deviations.