Supporting Information

Water-Based Thixotropic Polymer Gel Electrolyte for Dye-Sensitized Solar Cells

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Figure S1 shows thixotropic behavior of water-based polymer gel electrolyte containing xanthan gum. The as-prepared electrolyte had a gel state, and lost its viscosity progressively by the applied shear rate, resulting in a fluidic sol state. As-prepared gel electrolyte progressively lost its viscosity as oscillating shear rate was applied to electrolyte, transforming it into fluidic sol electrolyte. Viscosity of fluidic sol electrolyte did not change by varying shear rate applied to electrolyte. However, after certain amount of time, fluidic sol electrolyte became viscous again and transformed back into initial gel electrolyte.

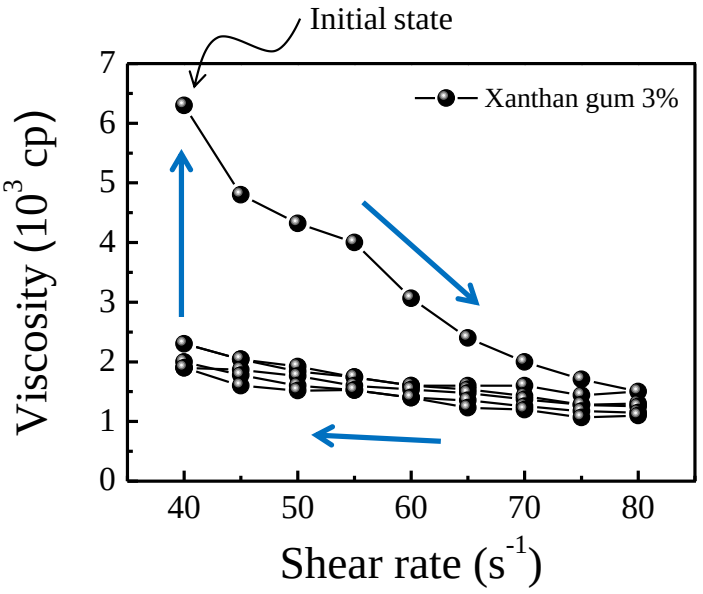

Figure S1. Change in viscosity of water-based polymer gel electrolyte containing xanthan gum with variation in shear rate applied to electrolyte and with passage of time. Viscosity was measured by oscillating shear rate from 40 to 80 s^{-1} several times.

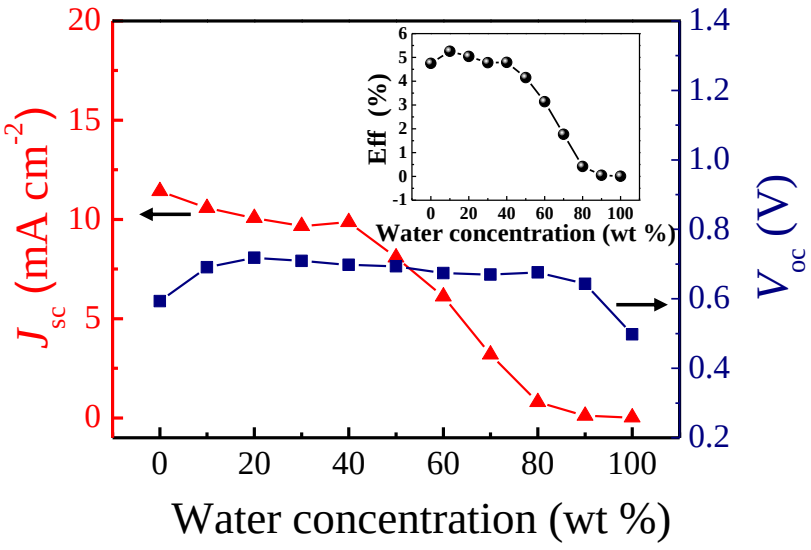

Figure S2. Trends for J_{sc}, V_{oc}, and Eff (inset) mesaured based on water concentration (wt %) in electrolyte. Data were obtained from *J-V* curves for DSSCs produced with different electrolytes under illumination (AM 1.5G, 100 mWcm^{-2}).

Decreased J_{sc} related to dye molecules detaching from TiO_2 electrode was examined, as shown in **Figure S3**. J_{sc} was measured after storing DSSCs in the dark state for 50 h. In addition, amount of dye adsorbed per unit active area was measured after disassembling DSSCs and then desorbing adsorbed dye molecules in mixture of 2-methyl-2-propanol and acetonitrile (volume ratio = 1:1) containing 0.1 M NaOH. This solution was examined using UV-vis spectroscopy (Perkin-Elmer Lambda 35). Amount of dye adsorbed per geometric area (1 cm^2) was calculated from measured absorbance.

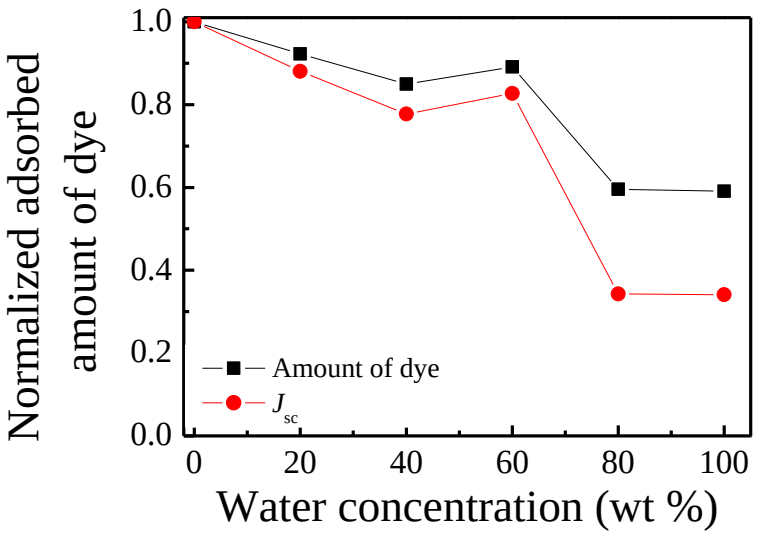

Figure S3. Normalized amount of dye adsorbed per unit active area, and J_{sc} measured based on water concentration in electrolyte after storing DSSCs in the dark state for 50 h.

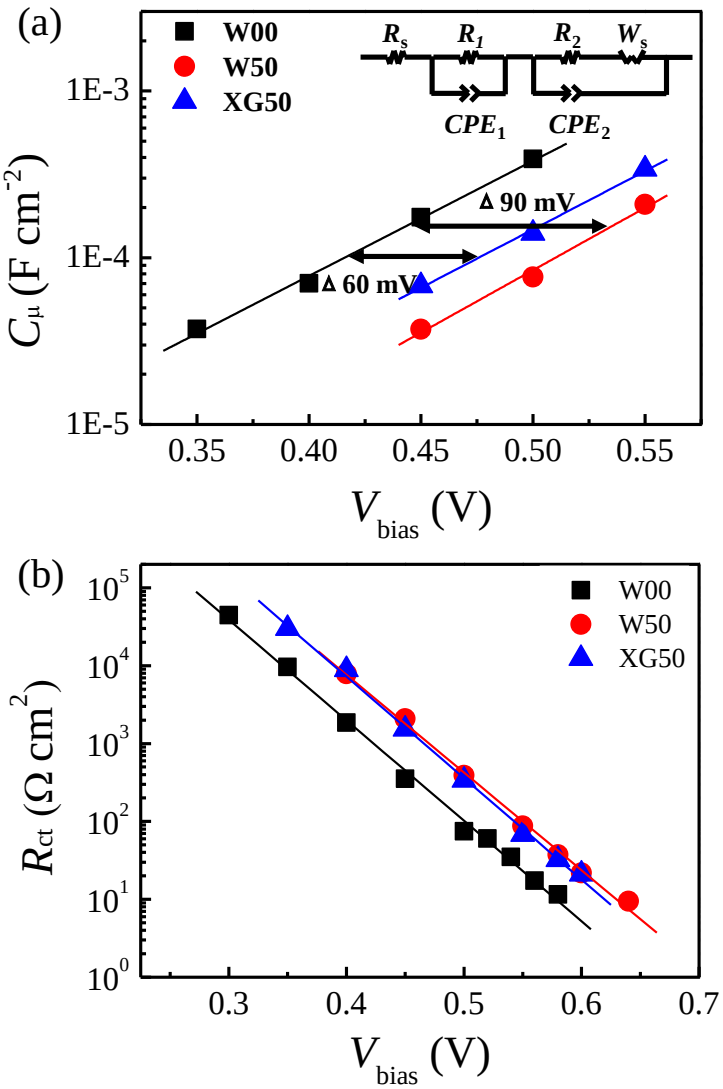

Figure S4. a) Chemical capacitance (C_μ) (inset: equivalent circuit model), and b) charge recombination resistance (R_{ct}) for the TiO_2 electrode employing different kind of electrolyte, according to the bias voltage (V_{bias}). Each value was evaluated from the impedance spectra in the dark state.