Electronic Supplementary Information (ESI)

Development of highly conductive PEDOT system by doping with partially crystalline sulfated cellulose and their electric conductivity

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1. Particle size distribution of PEDOT/CS and PEDOT/PSS particles measured by DLS

Fig. S1 showed the particle size distributions of PEDOT/CS particles and PEDOT/PSS particles measured by DLS.

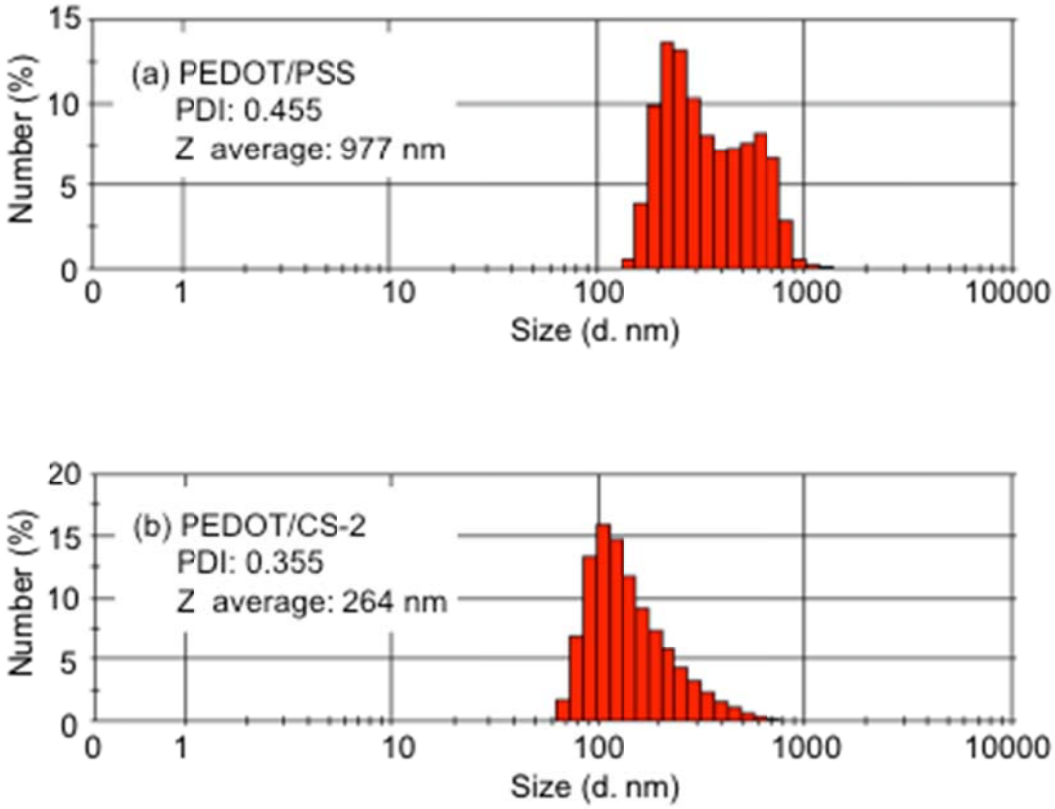

Fig. S1 Particle diameter distributions of PEDOT/PSS and PEDOT/CS-2.

2. Thickness and their electric conductivity of PEDOT thin films obtained from PEDOT/CS particles in H_2O and H_2O /ethanol dispersion

Table S1 summarizes the surface resistance and film thickness of these samples, as well as the volume resistance and electrical conductivity of the PEDOT thin films prepared from PEDOT/CS particles H_2O/ethanol mixed solution dispersion. The thickness of film obtained from H_2O dispersion (Table S1) became larger than that of the film obtained from H_2O/ethanol mixed solution dispersion (Table 4), because the mean diameter of PEDOT/CS particles in H_2O/ethanol mixed solution is larger than those in H_2O, as estimated from DLS of Fig. S1. Their electrical conductivities became higher slightly, with increasing of thickness of film for same type of PEDOT/CS (for example, PEDOT/CS-5: from 32 nm, 0.014 x 10^{-3} S cm^{-1} to 81 nm, 0.029 x 10^{-3} S cm^{-1}). Especially, the conductivities of CS-1, -2, -3, -4, and -5 showed tendency similar to Fig 4, as shown in Fig. S2.

Table S1 PEDOT thin films obtained from PEDOT/CS H_2O and H_2O/ethanol dispersion

Sample	t (nm)		ρ x 10^{-6} (Ω/sq.)		σ x 10^{3} ($S \cdot cm^{-1}$)	
	H_2O	H_2O/ethanol	H_2O	H_2O/ethanol	H_2O	H_2O/ethanol
PEDOT/CS-1	79	88	0.29	0.25	436	449
PEDOT/CS-2	59	63	0.25	0.22	576	735
PEDOT/CS-3	44	96	0.90	0.19	253	546
PEDOT/CS-4	53	100	13.1	0.20	14.0	50.0
PEDOT/CS-5	32	81	21500	4340	0.014	0.029

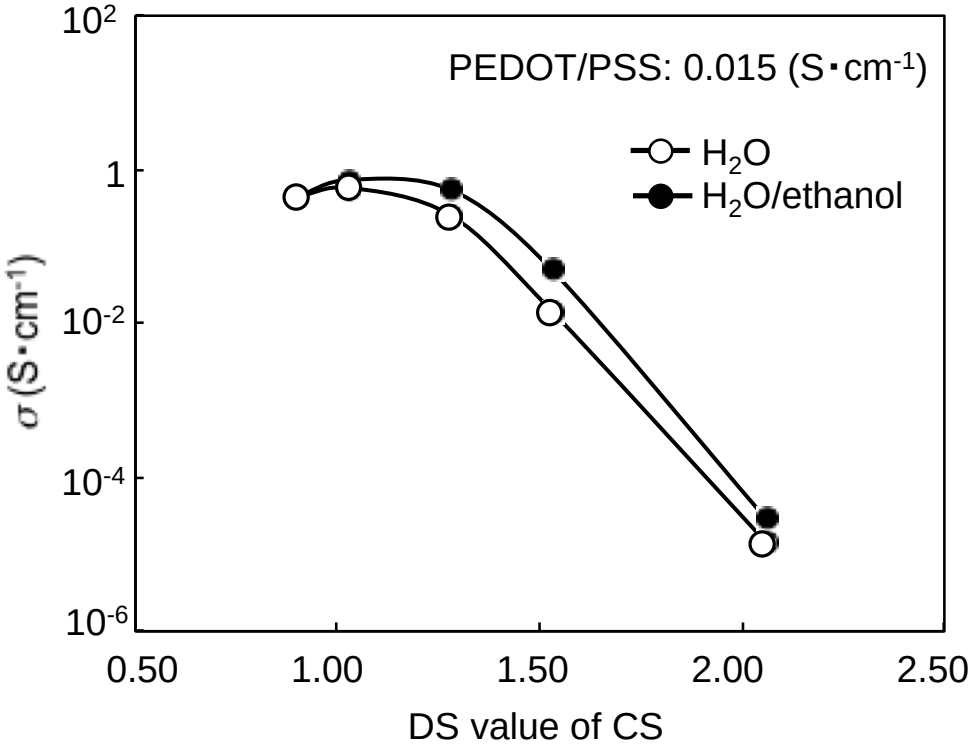

Fig. S2 Relationship between electrical conductivity and the degree of substitution of sulfuric groups. (○) H_2O and (●) H_2O/ethanol dispersion.