

Supplementary Information

Composite Electrolytes Comprised of Poly(Ethylene Oxide) and Silica Nanoparticles
with Grafted Poly(Ethylene Oxide)-Containing Polymers

Zhe Jia, Wen Yuan, Hui Zhao, Heyi Hu, Gregory L. Baker[§]

Department of Chemistry, Michigan State University, East Lansing, Michigan 48824,
United States

Correspondence to: Zhe Jia (jiazhe@msu.edu)

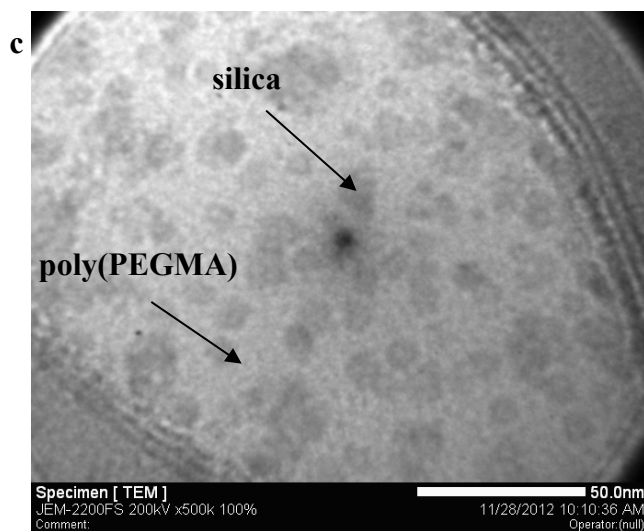
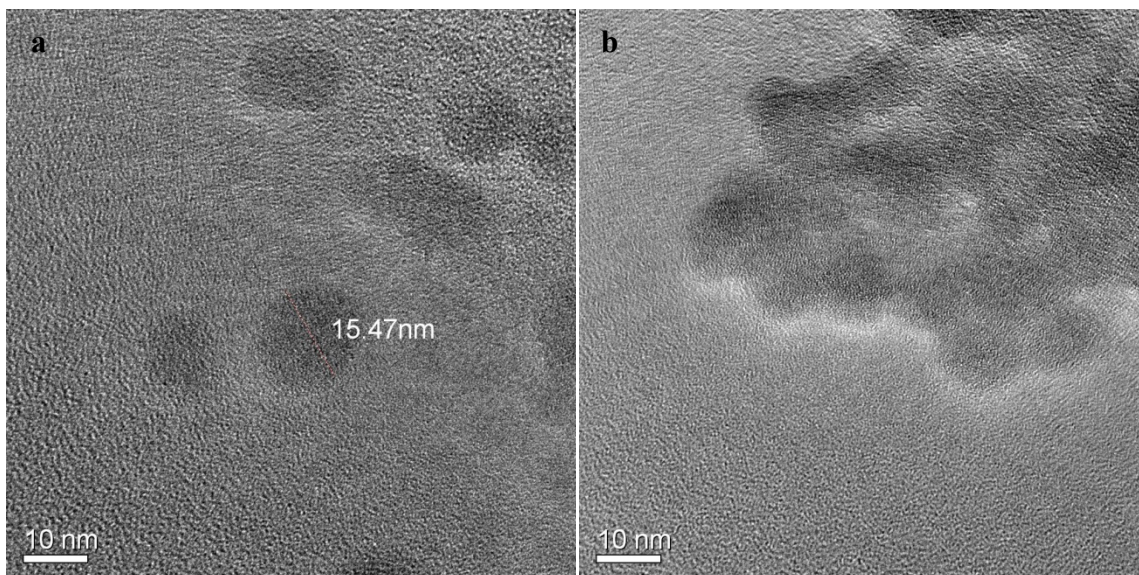
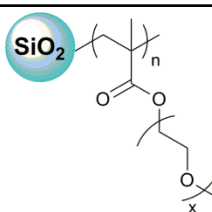


Fig. S1 TEM images of (a) bare silica particles; (b) initiator-coated silica nanoparticles; (c) polymer-coated silica nanoparticles (All samples were dispersed in water, dropped on an ultrathin carbon film copper grid, and dried before imaging)

Table S1 EW value of EO functional group in silica-poly(PEGMA) nanoparticles

	Silica-poly(PEGMA)	Weight loss ^a	x ^b	EW values of EO functional group (mol·eq ⁻¹) ^c
	Silica-poly(PEGMA-188)	82.2%	2	8.7×10^{-3}
	Silica-poly(PEGMA-232)	89.2%	3	1.2×10^{-2}
	Silica-poly(PEGMA-300)	90.8%	6	1.8×10^{-2}
	Silica-poly(PEGMA-475)	89.9%	10	1.9×10^{-2}
	Silica-poly(PEGMA-1100)	90.3%	25	2.1×10^{-2}

^a % of weight loss was obtained from TGA. Materials were heated up to 850°C under air.

^b x refers to an estimation of the number of PEO repeating units in the monomer, as

derived from the average molecular weight given by the manufacturers. ^c Take the

calculation of EW value in silica-poly(PEGMA-188) for example, 1 g of silica-

poly(PEGMA-188) contains 0.822 g poly(PEGMA-188) and 0.178 g silica. The

monomer molecular weight of poly(PEGMA-188) contains 2 EO repeating unit in the

monomer side chain. Therefore, the EW value of EO functional groups in silica-

poly(PEGMA-188) particles can be calculated as $0.822/188 \times 2 = 8.7 \times 10^{-3}$ mol·eq⁻¹.

The EW values for other poly(PEGMA) grafted silica nanoparticles can be determined

with the same protocol.

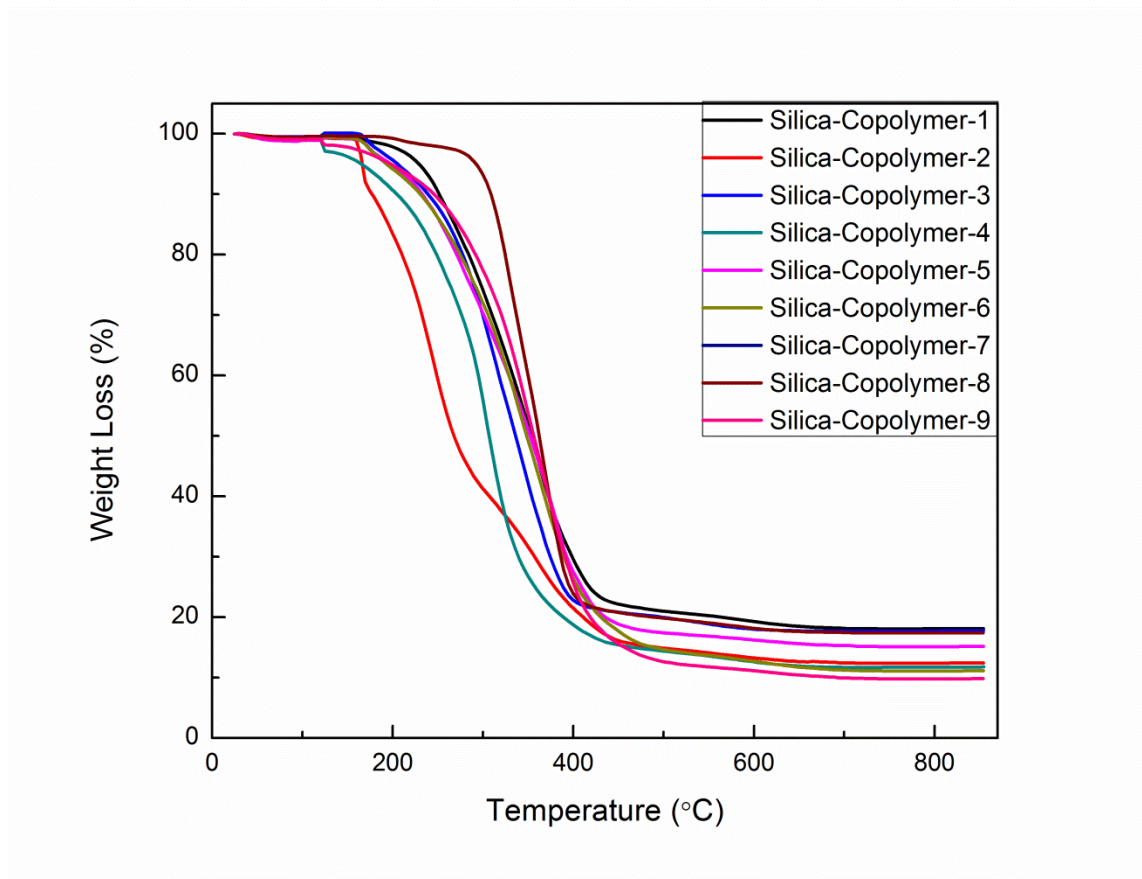


Fig. S2 TGA of silica-copolymers (Table 3 gives the copolymer compositions)

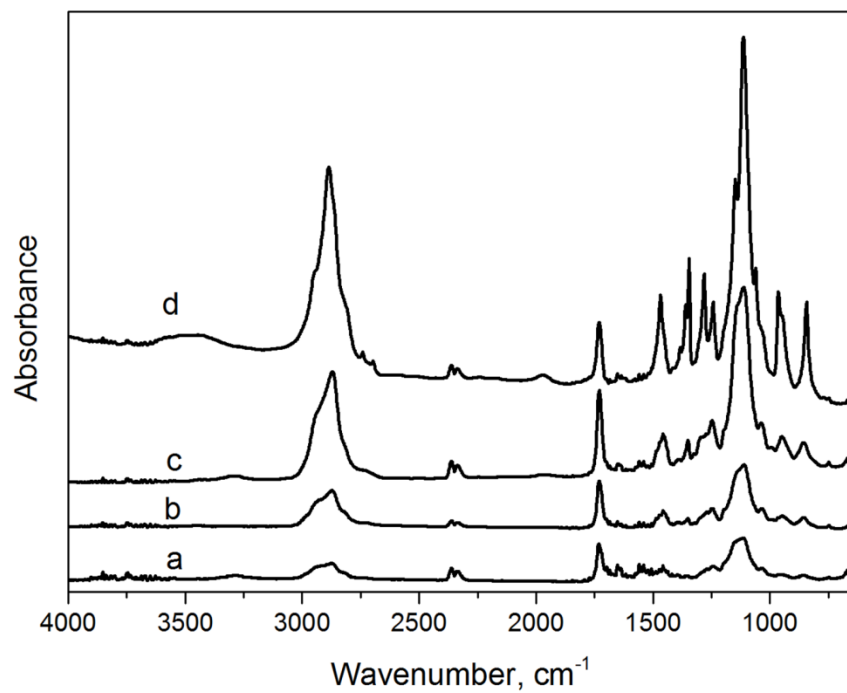


Fig. S3 FT-IR Spectrum of (a) free poly(PEGMA-232) homopolymer, (b) free poly(PEGMA-300) homopolymer, (c) free poly(PEGMA-475) homopolymer and (d) free poly(PEGMA-1100) homopolymer

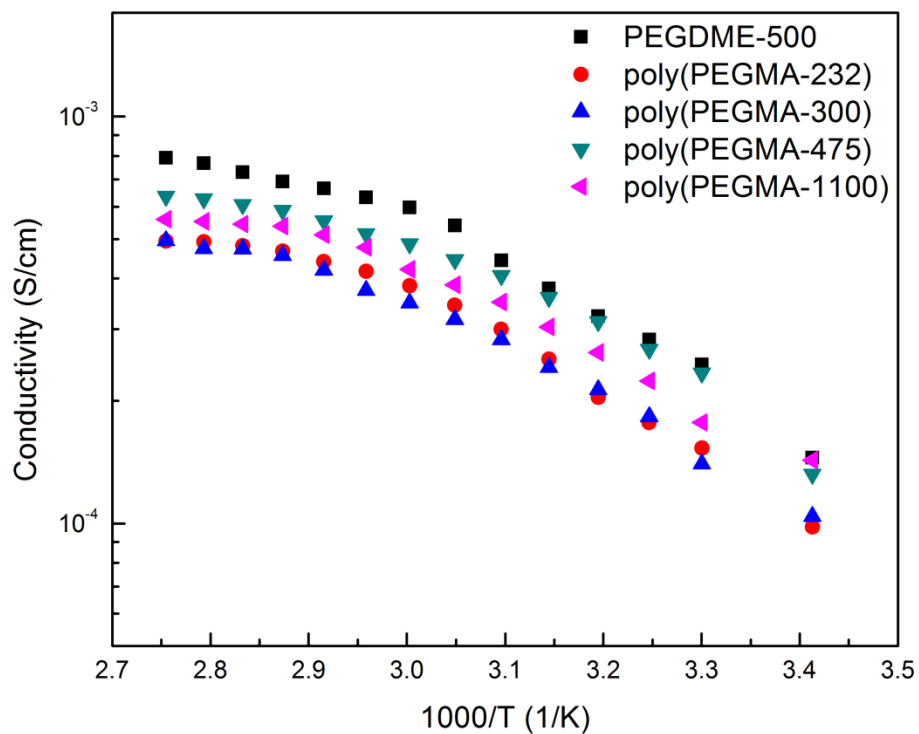


Fig. S4 Temperature-dependent ionic conductivities of electrolytes formed by free poly(PEGMA) homopolymers in PEGMDE containing LiI/I₂. The figure also shows data for PEGDME/ LiI/I₂ without modified particles.