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Charge transport kinetics in a robust radical-substituted polymer/nanocarbon composite electrode[1] KAN SATO, KENICHI OYAIZU, HIROYUKI NISHIDE, Department of applied chemistry, Waseda University — We have reported a series of organic radical-substituted polymers as new-type charge storage and transport materials which could be used for energy related devices such as batteries and solar cells. Redox-active radical moieties introduced to the non-conjugated polymer backbones enable the rapid electron transfer among the adjacent radical sites, and thus large diffusive flux of electrical charge at a bulk scale. Here we present the elucidated charge transport kinetics in a radical polymer/single-walled carbon nanotube (SWNT) composite electrode. The synergetic effect of electrical conduction by a three-dimensional SWNT network and electron self-exchange reaction by radical polymers contributed to the 10^5-fold (per 1 g of added SWNT) boosting of electrochemical reactions and exceptionally large current density (greater than 1 A/cm^2) as a rechargeable electrode. A totally organic-based secondary battery with a submicron thickness was fabricated to demonstrate the splendid electrochemical performances.

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Kan Sato
Department of applied chemistry, Waseda University

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