

STRUCTURE AND ELECTROCHEMICAL PROPERTIES OF FULLERENE LIPIDS

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We have interested in the hybrid material of fullerene and lipid bilayer membranes. Synthetic lipid bilayer membranes possess fundamental physico-chemical properties similar to those of biomembranes and can be immobilized onto a variety of substrates as multilayer films by several means. We describe herein unique structure and electrochemical properties of C₆₀-bearing artificial lipids with a triple-alkyl chain of C₁₆ (lipid **1**), C₁₄ (lipid **2**), or C₁₂ (lipid **3**).¹

DSC data revealed that cast films of **1** exhibited two endothermic peaks at temperature range of 35-40 °C (main transition) and 47-49 °C (subtransition) in air, water and 0.5 M tetraethylammonium chloride aqueous solution; while each cast film of **2** and **3** showed one endothermic peak at 50-57 °C. Together with the results of temperature dependent FT-IR and UV-vis spectra for cast films of **1-3** indicated that the main peak in the DSC thermogram of a **1** film is attributable to the typical phase transition as seen in lipid bilayer membranes and the subpeak of a **1** film and peaks of **2** and **3** films come from the change in the orientation of the C₆₀-moieties (Figure 1). The X-ray diffraction diagrams for each cast film of **1-3** showed a diffraction peak corresponding to (001) plane, suggesting the formation of molecular bilayer membrane structures. Cyclic voltammograms and Osteryoung square-wave voltammograms for each cast film of **1-3** on basal plane pyrolytic graphite electrodes displayed strong temperature

dependence (Figure 2). The electrogenerated radical mono- and dianions of the fullerene lipids have been found to bind strongly with “soft” electrolyte cations, namely large tetra-n-butylammonium and tetra-n-butylphosphonium ions.

1) T. Nakanishi, M. Morita, H. Murakami, T. Sagara, and N. Nakashima, *Chem. Eur. J.*, **8**, 1641-1648 (2002).

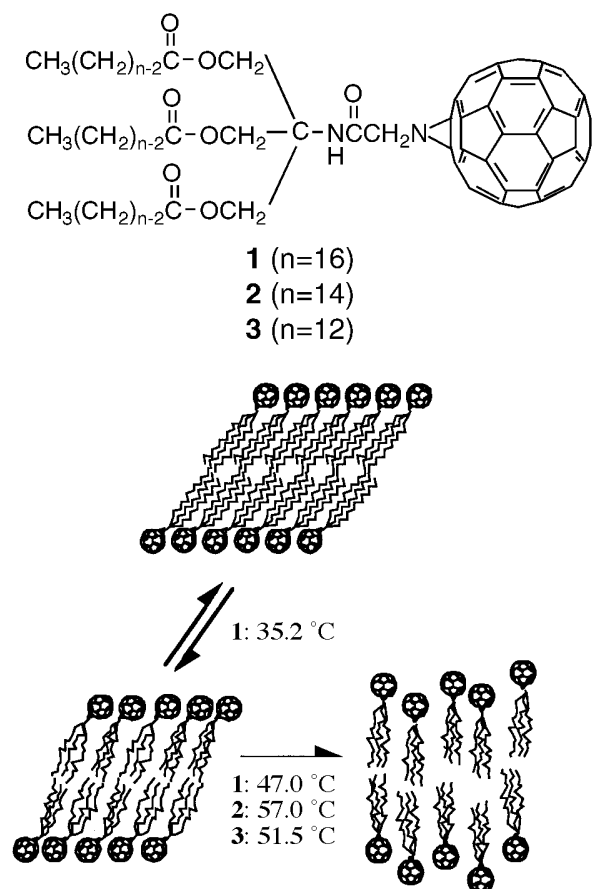


Figure 1. Schematic illustration for the phase transitions of cast films of **1**, **2** and **3**.

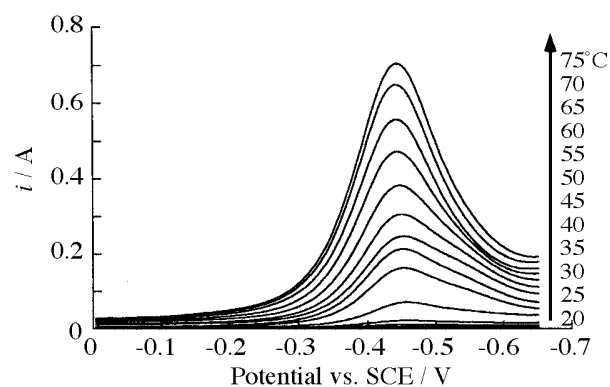


Figure 2. Temperature dependence of the OSWVs (pulse amplitude 25 mV, frequency 15 Hz) for a cast film of **1** on a BPG electrode in 0.5 M aqueous solution.