In the present study, we report the fabrication of Langmuir-Blodgett (LB) films and adsorption films of fullerene-functionalized dendrons, fullerodendrons (Cn(Gn-COOMe)) (n=0.5, 1.5, 2.5), and investigate molecular arrangement within these thin films by X-ray reflectometry (XR). Additionally, the electrochemical properties of these films are investigated based on cyclic voltammetry, and the influence of fabrication methods, dendron generations, and terminal groups is compared and discussed.

Figure 1 shows the π-A isotherms of Cn(Gn-COOMe) at the air/water interface. In the case of Cn(G1.5-COOMe), the occupied area per molecule is less than the expected value for a fullerene moiety, suggesting that molecules were either, at least, partially offset or accumulated in Langmuir film. As for Cn(G2.5-COOMe), the occupied area is significantly larger than the expected one. This indicates that bulky dendritic moiety disturbs closed packing of fullerene moieties and controls the occupied areas per molecule.

The LB films possessed well-ordered structure, although the adsorption method led random orientation of molecules. As to Cn(G2.5-COOMe), the LB film took two-layer structure in which the fullerene moieties were at air side and the dendron moieties were at substrate side (Fig.2 and Fig.3). On the other hand, Cn(G1.5-COOMe) leads four-layer structure consisting of double layer of molecules, and fullerene moieties exist in interior layers of the LB films. With increasing generation of dendron, the monolayer formation ability at the air/water interface as amphiphilic molecule strengthens and the amphiphilic property becomes superior to the fullerene-fullerene attractive interaction that prevents the monolayer formation. Furthermore, in the case of Cn(G0.5-COOMe) and Cn(G1.5-COOMe), the redox peak of LB film remained even after UV light irradiation. On the contrary, the peak of Cn(G2.5-COOMe) LB film disappeared, indicating that molecular arrangement in the films affects to electrochemical property.