Electrochemical Characteristics of "Aluminium Carbide Whisker"

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Introduction

Advanced materials, aluminium carbide whiskers, were prepared on aluminium foil with fixed carbon particles by means of special heat treatment using hydrocarbon gas. These materials are expected for electrodes and current collectors of electric double layers capacitors and secondary batteries.

In this work, interesting electrochemical characteristics and performance were obtained.

Experimental

The specimens, of 99.3 mass% aluminum foil in 50 µm thickness, were coated with carbon particles of ~1 µm in diameter. The thickness of the coated layer was varied from 1 to 4 µm/each side, and then all the specimens were heat-treated at 823K for 25ks in hydrocarbon gas atmosphere.

At first, the capacitance of each specimen was measured by LCZ meter (2321, NF Electron Instruments) with 120 Hz.

Results

Figures 1 and 2 show secondary electron micrograph of the surface and cross-section with carbon particles fixed on aluminium foil respectively. The carbon particles in 4-5 layers are stuck to aluminium carbide whiskers strongly, and substantially the whiskers and aluminium foil seem as one body. The details of the morphology and the composition will be reported in another session.[1)]

The capacitance of the species is proportional to the thickness of the carbon-coated layer, as shown Figure 3. Following the results, the capacitance of the material increases with the thickness of the carbon layer.

The impedance measurement indicates low resistivities of the specimen surface.

The prospect of these advanced materials will be discussed in connection to the application.

Reference

1) C.Lu, Z.Ashitaka, H.Tada S.Arai and H.Saka, will be presented at session of "Nanotechnology", in 2004 Joint International Meeting, Hawaii (2004).

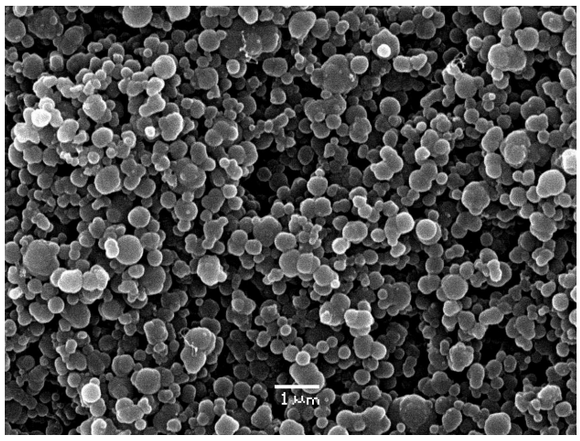

Fig.1 Secondary electron micrograph of surface with carbon particles fixed on aluminium foil.

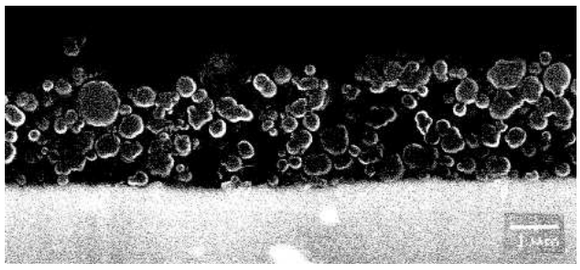

Fig.2 Secondary electron micrograph of cross-section with carbon particles fixed on aluminium foil.

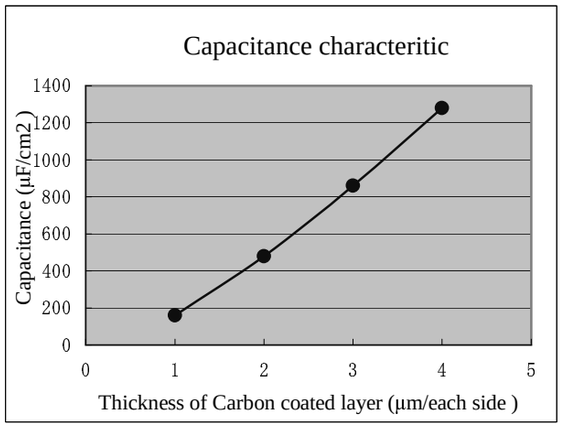

Fig.3 Correlation between thickness of carbon coated layer and capacitance.