Control of Tunnel Etching Sites of Al Foil for Electrolytic Capacitors Using Imprinting Process

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The electrochemical tunnel etching of Al foil is widely used for increasing the surface area in electrolytic capacitor electrodes [1-3]. To optimize the performance of the electrolytic capacitors, it is essential to control the initiation sites of tunnel etching of Al foil. In the present work, we describe the process for the precise control of the tunnel etching sites using pretexturing of Al foil prior to electrochemical etching treatment in HCl solution[4].

Pretexturing of an Al foil was carried out based on imprinting process using a metal mold, which has an ideally ordered array of convexes in triangular lattice with interval of 10 μm (Fig. 1). The specimens were Al foil with 99.99% purity composed of (100) planes (>95%). After the imprinting, an ordered array of concaves was formed on the Al foil. After the imprinting, electrochemical etching was carried out under constant current condition in a 5 M HCl electrolyte. The structure of Al foil after the electrochemical etching was examined by scanning electron microscope (SEM).

Figure 2 shows the SEM micrograph of a typical etched Al foil using pretexturing process. The ideally arranged tunnel pits were observed over the sample. The interval of the pits corresponded to that of convex in metal mold.

![Schematic for control of the etching sites](image)

![SEM micrograph of surface of etched Al foil](image)

The present process will be used for the preparation of Al foil for the electrolytic capacitor electrode with optimized performance.