# Template-Assisted Synthesis and Catalytic Properties of Copper Nanowires

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Recently, porous anodic alumina (PAA) has attracted material scientists' attention due to its special applications in self-assembled nanomaterials. More and more nanomaterials, such as metals, alloys, and polymers, have been fabricated using PAA templates which were obtained by the anodic oxidation of aluminum in an acidic solution. Nowadays, there has been increasing interest in the fabrication of various metal nanowires through the PAA-template electrodeposition. On the other hand, carbon nanofibers have attracted much attention because of their wide range of applications [1]. In this study, copper nanowires were directly obtained by direct current PAA-templated electrodeposition. Experimental results demonstrate that the morphologies of copper nanowires depend on the homogeneity and arrangement of porous anodic alumina. Consequently, the morphology of copper nanowires affects the synthesis of carbon nanofibers by catalytic pyrolysis of acetylene using copper nanowires as catalysts.

Regarding the preparation of porous anodic alumina template, we investigated the influence of different parameters on the formation of PAA templates, such as reaction temperature, voltage, and the pre-treatment of aluminum. The barrier of PAA templates were dissolved by electrolyzing neutral solution with PAA as a cathode and carbon electrode as an anode, and copper nanowires were then synthesized within PAA templates by direct current electrodeposition and characterized using field-emission scanning electron microscopy. At last, carbon nanofibers were catalytically synthesized using acetylene as carbon resource and copper nanowires as catalyst.

For example, as given in Fig. 1, using oxalic acid as electrolyte under 40 V for 3 h, the obtained PAA template had a mean pore diameter of 50～60nm. Subsequently, under the voltage of 1-5 V, the diameter of copper nanowire was the same as the pore size of PAA templates.

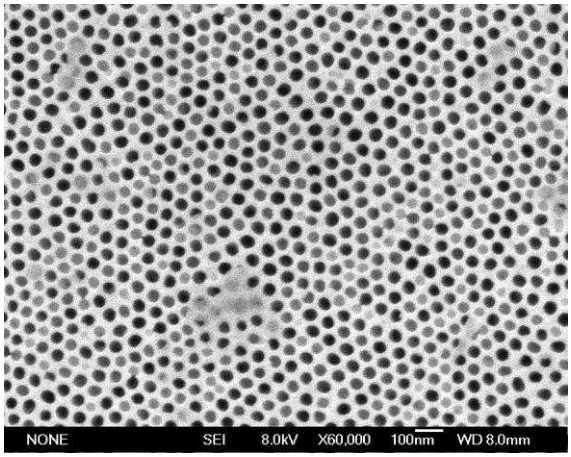


Fig. 1 SEM image of PAA template prepared by two-step anodic oxidation in oxalic acid under the voltage of 40 V for 3 h.

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**References**

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