

AC–DC Electrodeposition Method for High Laser-X Ray Conversion Efficiency Material

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Abstract: The nanostructured metal is a kind of high laser-X ray conversion efficiency material in inertial confinement fusion (ICF) experiments. Deposition into anodized aluminum oxide (AAO) template is widely used for metal nanowire fabrication. To acquire Au nanowire array in the AAO template with Al₂O₃ barrier layer, a simple and efficient combined AC–DC electrodeposition method is firstly proposed in this paper. The results showed that the Au nanowires obtained by the combined AC–DC method have uniform length as prepared by AC method and the upper limit of current density of deposition used in the combined AC–DC method can be much higher than that in single DC electrodeposition. The cyclic voltammetry of blank AAO template and the one after AC preplating show that the cathodic peak is more negative after the AC preplating. A new mechanism in terms of AC–DC electrodeposition method based on this sample is proposed. The evidence comes from the result that the branched Au nanowires formed in AC preplating display shorter length and more smaller branches comparing with the one formed in DC plating. It is concluded that AC preplating's filling the branched pores and changing the reactive surface is the essential reason of difference in the combined AC–DC and single DC electrodeposition methods.

Key Words: Au nanowire, AC–DC electrodepositon, AAO template

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