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Electrochemical Synthesis and Hydrophilicity of Micro-pored Aluminum Foil

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Abstract

Materials with textured surfaces have attracted great interests due to the unique characteristics, such as high specific surface area, light weight, and excellent electronic or magnetic performances. Current approaches to manufacture porous materials have been limited by being complicated, costly, and time-consuming. Here we demonstrate a facile and cost-effective method to fabricate an unprecedented macropore-arrayed structure on an aluminum foil through electrochemical etching. The process was carried out at a galvanostatic mode of electrochemical reaction, in which the aluminum foil was the working electrode. The electrolytic solution contained perchloric acid and ethanol. Pores were observed using various characterization techniques such as digital optical microscopy, scanning electron microscopy, and interferometer. With extended etching time, the pore density was increased while the pore size remained to be consistent (~15 μm in diameter). Further examination showed that the surface hydrophilicity was improved due to the existence of pores. The increased pore density is responsible for reduced contact angle. The new finding offers the potential economical and practical applications of the pored aluminum surface in designing novel hierarchical structures.

Keyword: pored surface, porous material, electrochemical etching, wetting angle, hydrophilicity

Highlight

- A facile and cost-effective method to fabricate macropore-arrayed structure on an aluminum foil is proposed.
- Surface hydrophilicity is improved due to the existence of pore structure.
- Offer potential applications in designing novel hierarchical structures.