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# Morphologies and wetting properties of copper film with 3D porous micro-nano hierarchical structure prepared by electrochemical deposition

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## Abstract

Three-dimensional porous micro-nano hierarchical structure Cu films were prepared by electrochemical deposition with the Hydrogen bubble dynamic template. The morphologies of the deposited films characterized by Scanning Electronic Microscopy (SEM) exhibit a porous micro-nano hierarchical structure, which consists of three levels in different size scales, namely the honeycomb-like microstructure, the dendritic substructure and the nano particles. Besides, the factors which influenced the microscopic morphology were studied, including the deposition time and the additive Ethylene diamine. By measuring the water contact angle, the porous copper films were found to be super-hydrophobic. The maximum of the contact angles could reach as high as 162.1°. An empirical correlation between morphologies and wetting properties was revealed for the first time. The pore diameter increased simultaneously with the deposition time while the contact angle decreased. The mechanism was illustrated by two classical models. Such super-hydrophobic three-dimensional hierarchical micro-nano structure is expected to have practical application in industry.

**Keywords:** Hierarchical structure, porous film, electrochemical deposition, morphology, super-hydrophobicity

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