Effect of Selected Process Parameters on Efficiency Enhancement of Electrochemical Etching and Polishing of Tungsten under Forced Convection

Yuanlong Chen*, Peixuan Chen, Hua Lin, Xiang Li

School of Mechanical Engineering, Hefei University of Technology, Hefei 230009, China

*E-mail: chenyuanlong@mail.hfut.edu.cn

doi: 10.20964/2020.11.72

Received: 23 July 2020 / Accepted: 11 September 2020 / Published: 30 September 2020

Tungsten coating of the thermionic emitter of the thermionic energy converter (TEC) was electrochemical polished (ECP) and etched (ECE) to enhance the electronic work function of the coating. The machining efficiency of these two electrochemical processes can be improved by using forced convection in alkaline solution. The tungsten anodic dissolution under forced convection in NaOH solution can be divided into the etching stage and the polishing stage according to the relationship between the current density and the applied voltage and the surface morphology. The influences of electrode distance, flow rate and NaOH concentration on the current density of tungsten anodic dissolution were analyzed. The current density can be enhanced by selecting these process parameters rationally and the efficiency of ECE or ECP is improved.

Keywords: Tungsten; Forced convection; Electrochemical etching; Electrochemical polishing; Current density

[FULL TEXT](#)

© 2020 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).