Fabrication of Nanocrystalline Ni–Co Coatings by Electrodeposition under Supergravity Field

Xiaoyun Hu^{1,*}, Ningsong Qu^{1,2}

¹ Nanjing University of Aeronautics and Astronautics, Nanjing 210016, People's Republic of China

² Jiangsu Key Laboratory of Precision and Micro-Manufacturing Technology, Nanjing 210016, People's Republic of China

*E-mail: hxyun@nuaa.edu.cn

doi: 10.20964/2019.12.01

Received: 22 March 2019 / Accepted: 16 July 2019 / Published: 29 October 2019

Ni–Co coatings on stainless steel substrates are prepared using electrodeposition assisted by a supergravity field. Transmission electron microscopy reveals the nanometer-scale grain size of the as-prepared Ni–Co coatings, confined to around 15 nm, to have likely been due to crystal formation and growth under supergravity conditions. In comparison, electrodeposited coatings obtained under normal gravity without the addition of saccharin exhibit a much larger grain size. Energy dispersive spectroscopy analysis clearly shows a Co content of 40.56 wt.% in the Ni–Co coatings after having used a Co bath concentration of 40 g/l, which cannot be achieved under normal gravity. A maximum microhardness of 660 HV is obtained, also unachievable under normal gravity. Moreover, Ni–Co coatings produced under supergravity show increased resistance to wear compared with their normal-gravity counterparts. We conclude that the high quality inherent to the nanocrystalline Ni–Co coatings originates from the improved crystallinity and increased Co content arising from the use of supergravity.

Keywords: electrodeposition; Ni–Co coating; supergravity field; microhardness; wear resistance

[FULL TEXT](#)

© 2019 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/>).