Title: Spontaneous escape behavior of silver from graphite-like carbon coating and its inhibition mechanism

Authors: Wenting Shao, Xinyu Zhang, Bailing Jiang, Cancan Liu, Hongtao Li

PII: S1005-0302(17)30205-0
DOI: http://dx.doi.org/doi:10.1016/j.jmst.2017.07.024
Reference: JMST 1041

To appear in:

Received date: 31-5-2017
Revised date: 17-7-2017
Accepted date: 28-7-2017

Please cite this article as: Wenting Shao, Xinyu Zhang, Bailing Jiang, Cancan Liu, Hongtao Li, Spontaneous escape behavior of silver from graphite-like carbon coating and its inhibition mechanism (2010), http://dx.doi.org/10.1016/j.jmst.2017.07.024

Spontaneous escape behavior of silver from graphite-like carbon coating and its inhibition mechanism

Wenting Shao [1], Xinyu Zhang [1], Bailing Jiang [1, 2, *], Cancan Liu [1], Hongtao Li [1]

[1] *College of Materials Science and Engineering, Nanjing Tech University, Nanjing 210009, China*

[2] *College of Materials Science and Engineering, Xi'an University of Technology, Xi'an 710048, China*

* Corresponding author. Prof.

E-mail address: jiangbail@vip.163.com (B.L. Jiang).

[Received 31 May 2017; Received in revised form 17 July 2017; Accepted 28 July 2017]

A series of silver-doped graphite-like carbon coatings was prepared on the surface of aluminum alloy using the magnetron sputtering method. The spontaneous escape behavior and inhibition mechanism of silver from graphite-like carbon coating were studied. The results showed that when the sample prepared with a 0.01-A current on the silver target was placed in an atmospheric environment for 0.5 h, an apparent silver escape phenomenon could be observed. However, the silver escape phenomenon was not observed for samples prepared with a 0.05-A current on the silver target if the sample was retained in a 10^{-1} Pa vacuum environment, even after 48 h. Compared with the sample placed in the atmospheric environment immediately after an ion plating process, the silver escape time lagged for 6 h. Nanometer-thick pure carbon coating coverage could effectively suppress silver escape. When the coating thickness reached 700 nm, permanent retention of silver could be achieved in the silver-doped graphite-like carbon coating. As the silver residue content in the graphite-like carbon coating increased from 2.27 at.% to 5.35 at.%, the interfacial contact resistance of the coating decreased from 51 mΩ cm^2 to 6 mΩ cm^2.

Keywords: Silver; Graphite-like carbon coating; Spontaneous escape mechanism;