Performance of Coating Based on β -CD-g-GO/epoxy Composites for the Corrosion Protection of Steel

Chun Feng^{1,2,*}, Lijuan Zhu^{1,2}, Yaqiong Cao^{1,2}, Yin Di³, Zongxue Yu^{3,*}, Guhui Gao⁴

¹ CNPC Tubular goods research institute, Xi'an, 710077, China.

² State Key Laboratory for Performance and Structure Safety of Petroleum Tubular Goods and Equipment Materials, Xi'an, 710077, China.

³ Southwest Petroleum University, School of Chemistry and Chemical Engineering, Chengdu, 610500, China.

⁴ Redbud Innovation Institute, Baodi, Tianjin, 301800, China.

*E-mail: fengchun003@cnpc.com.cn haiqingy@163.com

doi: 10.20964/2019.02.12

Received: 27 July 2018 / Accepted: 21 September 2018 / Published: 5 January 2019

This study reports a new strategy for enhancing the anti-corrosion properties of epoxy coatings. For this purpose, beta-cyclodextrin-graphene oxide (β -CD-g-GO) nanosheets were synthesized via anchoring beta-cyclodextrin on a graphene oxide surface in the presence of 3-glycidoxypyltrimethoxysilane (KH560). The structure of the material was characterized by SEM, EDX, XRD, FT-IR and TGA. The inclusion of 2 wt. % GO and β -CD-g-GO nanosheets in epoxy resin remarkably enhanced the corrosion protection performance of the material relative to that of pure epoxy coating. Electrochemical impedance spectroscopy (EIS) measurements revealed that the impedance of the epoxy coating was improved after the addition of 2 wt. % GO and β -CD-g-GO nanosheets. The most pronounced improvement in the properties of the epoxy coating was obtained using β -CD-g-GO nanosheets. Scratches tests confirmed the reduced steel substrate corrosion in the case of epoxy coating that included β -CD-g-GO nanosheets compared to the corrosion obtained for other samples.

Keywords: Graphene oxide, Beta-cyclodextrin, Corrosion resistance, Epoxy coating

[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/>).