Size Influences of SiO₂-graphene Barrier on the Corrosion Resistance of Epoxy-Acrylic Waterborne Coating

Yifan Shen¹, Jingxia Yang^{1,2,*}, Shuchuan Wang², Lingzhi Jing¹, Hao Zheng¹, Yangyang Du¹, Bingjie Zou¹, Xuanzheng Lei¹, Jingli Xu^{1*}

¹ College of Chemistry and Chemical Engineering, Shanghai University of Engineering Science, LongTeng Road 333, Shanghai 201620, P. R. China

² T&H chemicals CO. LTD, Tangxi Industrial Zone, Quanzhou Luojiang District, 362011, Fujian, P.R. China

*E-mail: yjx09tj@foxmail.com (J. Yang), xujingli@sues.edu.cn (J. Xu)

doi: 10.20964/2021.01.33

Received: 19 September 2020 / Accepted: 2 November 2020 / Published: 30 November 2020

SiO₂-Graphene composited materials can be used as anti-corrosion barriers, which were dispersed in waterborne epoxy-acrylic (EA) resin. Under the same mass of SiO₂ and Gr, the particle size of SiO₂ determines the particle number and surface area, which further influence the coverage of Gr on SiO₂ and their anticorrosion performance. In this research, SiO₂ spheres with three different particle sizes (150, 400, 500 nm) were used to composite with graphene (Gr), and they were linked by bi-functional ligand para-aminobenzoic acid(P), and the designed SiO₂-P-Gr were dispersed in EA resin as anticorrosion barriers, and the influence of SiO₂ particle size is focused. SiO₂-P-Gr barrier can greatly reduce the corrosion current density i_{corr} , from 3.2×10^{-7} A/cm² (pure EA coating) to 5.1×10^{-9} A/cm² (EA+150nmSiO₂+P+Gr coating), due to the increased resistances for charge transfer (according to EIS fitting) of SiO₂+P+Gr barrier. Especially, 500nmSiO₂-P-Gr exhibited excellent shield in both low and high frequency region according to Bode plot, which may be attributed to the different graphene coverage on the SiO₂ particles with different size under the same mass control.

Keywords: Anti-corrosion; Barrier; Coating; Graphene; SiO₂ sphere

[FULL TEXT](#)

© 2021 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/>).