Highly Crystalline Graphene Integrated Polyaniline Nanostructured Composites for Protecting Steels from Corrosion in Acidic Environment

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We report on synthesis, characterization and application of highly crystalline graphene integrated polyaniline (PaniGn) nanostructured composites as corrosion protection coatings. The coated surface showed a decline in corrosion current up to ~3-4 orders of magnitude in 0.1 M HCl. SEM reveals several pits on the surface after the corrosion tests. To explain the observations and understand the fate of the composite coating during corrosion, we present here a molecular model using quantum chemical calculations based on density functional theory. The model presents a plausible mechanism of the protection behavior of the composite coating.