

## Homogeneous Anti-Corrosion Coating of Spontaneously Dissolved Defect-Free Graphene

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**Abstract :** A recent study by the World Corrosion Organization estimated that corrosion related damage causes \$2.5tr worth of damage every year. As such, a low cost easily scalable solution is required to the corrosion problem which is economically viable. Graphene is an ideal anti-corrosion barrier layer material due to its excellent barrier properties and chemical stability, which makes it impermeable to all molecules. However, attempts to employ graphene as a barrier layer has been hampered by the fact that defect sites in graphene accelerate corrosion due to the inert nature of graphene which promotes galvanic corrosion at the expense of the metal. The recent discovery of spontaneous dissolution of charged graphite intercalation compounds in aprotic solvents enables defect free graphene platelets to be employed for anti-corrosion applications. These 'inks' of defect-free charged graphene platelets in solution can be coated onto a metallic surfaces via electroplating to form a homogeneous barrier layer. In this paper, initial data showing homogeneous coatings of graphene barrier layers on steel coupons via electroplating will be presented. This easily scalable technique also provides a controllable method for applying different barrier thicknesses from ultra thin layers to thick opaque coatings making it useful for a wide range of applications.

**Keywords :** anti-corrosion, defect-free, electroplating, graphene

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