

## Anti-Corrosive Graphene Nanocomposite Coatings

This technology has the potential to be a scalable solution for replacement of a carcinogen/environmental toxin widely used as a corrosion inhibitor.

**Keywords:** chromate replacement, graphene, carbon nanotubes, coatings

### Process Implementation Readiness



### Background and Technology Description

Replacement of chromate coatings for corrosion protection of low alloy steels represents an urgent imperative given the carcinogenic nature of hexavalent chromium and the increasingly stringent regulatory restrictions addressing chrome electroplating.

Collaborative efforts led by the Department of Chemistry at the University of Buffalo have resulted in a scalable roller coating approach for wire bar deposition of polymer/graphene nanocomposite coatings on low alloy steels. The nanoparticle fillers are well dispersed within the polymer matrix as a result of  $\pi-\pi$  interactions between the polymer backbone and the  $\pi$ -conjugated basal planes of graphene. The coatings show excellent adhesion to the steel substrates and withstand greater than 3100 h of continuous exposure to a 3.5% saline environment.

### Technology Benefits and Value

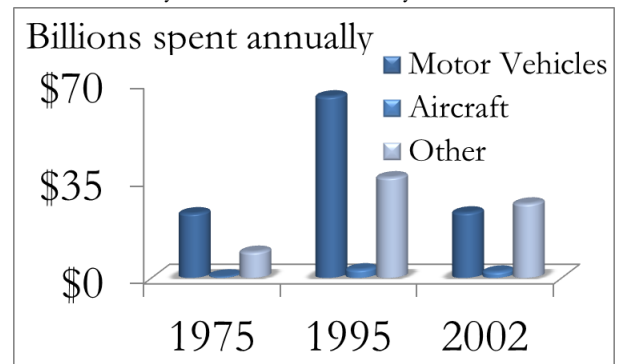
- Hybrid nanocomposites solve the adhesion problems of polymeric coatings and the inevitable porosity of nanostructured coatings
- Inclusion of conductive carbon nanomaterials forms robust passivation layer

Sample	Corrosion Rate (mm/yr)
Galvanized Steel	$3.87 \times 10^{-2}$
Uncoated Low-Alloy Steel	$1.22 \times 10^{-1}$
Polymer coating	$9.24 \times 10^{-3}$
2 wt.% nanocomposite	$5.52 \times 10^{-4}$
20 wt.% nanocomposite	$8.46 \times 10^{-4}$

### Target Customers

#### Structural, Automotive, Maritime, and Aerospace

The U.S. Government Accountability Office estimates that the US spends more than \$20B/yr in Department of Defense corrosion-related expenses. Wheeled vehicle corrosion alone costs the U.S. Army in excess of \$2.5B/yr.



Industrially, costs of corrosion are in the billions. This nanocomposite coating works with many kinds of steel to be a sound economic and environmental chromate coating replacement.

### Intellectual Property

Provisional patent has been filed.

### Opportunity

NYSP2I is interested in working with qualified parties for technology and product development of this process.

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