Raman Singh
Monash University, Melbourne, Australia

Graphene Coatings - A Disruptive Approach for Mitigation of Environment-assisted Degradation

Corrosion and its mitigation costs dearly (any developed economy loses 3-4% of GDP due to corrosion, which translates to ~$250b to annual loss USA). In spite of traditional approaches of corrosion mitigation (e.g., use of corrosion resistance alloys such as stainless steels and coatings), loss of infrastructure due to corrosion continues to be a vexing problem. So, it is technologically as well as commercially attractive to explore disruptive approaches for durable corrosion resistance.

Graphene has triggered unprecedented research excitement for its exceptional characteristics. The most relevant properties of graphene as a corrosion resistance barrier are its remarkable chemical inertness, impermeability, and toughness, i.e., the requirements of an ideal surface barrier coating for corrosion resistance. However, the extent of corrosion resistance has been found to vary considerably in different studies. The author's group has demonstrated an ultra-thin graphene coating to improve the corrosion resistance of copper by two orders of magnitude in an aggressive chloride solution (i.e., similar to sea-water)1. In contrast, other reports suggest the graphene coating actually enhances corrosion rate of copper, particularly during extended exposures. The author's group has investigated the reasons for such contrast in corrosion resistance due to graphene coating as reported by different researchers. On the basis of the findings, the author's group has succeeded in demonstrating durable corrosion resistance as a result of the development of suitable graphene coating. The presentation will also assess the challenges in developing corrosion-resistant graphene coating on most common engineering alloys, such as mild steel, and presents results demonstrating circumvention of these challenges

Biography

Raman Singh is a professor in the Chemical and Biological Engineering Department, Monash University His research expertise includes Alloy Nano/Microstructure-Corrosion Relationship, stress corrosion cracking (SCC), Corrosion/SCC of Biomaterials, Corrosion Mitigation by Novel Material (e.g., Graphene), Advanced and Environmentally Friendly Coatings, High-Temperature Corrosion. He has supervised 50 Ph D. students. He has published over 250 peer-reviewed international journal publications, 15 books/book chapters, and over 100 reviewed conference publications. His professional responsibilities include editor-in-chief of two journals, Fellow ASM International and Engineers Australia, over 40 keynote/plenary talks at international conferences (besides numerous invited talks), leadership (as chairperson) of a few international conferences.

raman.singh@monash.edu