Complete long-term corrosion protection with chemical vapor deposited graphene

Despite numerous reports regarding the potential of graphene for corrosion protection, examples of chemical vapor deposited (CVD) graphene-based anticorrosive coatings able to provide long-term protection (i.e. several months) of metals have so far been absent. Here, we present a polymer-graphene hybrid coating, comprising two single layers of CVD graphene sandwiched by three layers of polyvinyl butyral, which provides complete corrosion protection of commercial aluminum alloys even after 120 days of exposure to simulated seawater. The essential role played by graphene in the hybrid coating is evident when we compare the results from a polymer-only coating of the same thickness, which fails in protecting the metal after less than 30 days. With the emergence of commercially available large-area CVD graphene, our work demonstrates a straightforward approach towards high-performance anticorrosive coatings, which can be extended to other two-dimensional materials and polymers, for long-term protection of various relevant metals and alloys.

General information
State: Published
Organisations: Department of Micro- and Nanotechnology, Nanocarbon, Center for Nanostructured Graphene, Department of Chemical and Biochemical Engineering, CHEC Research Centre, The Hempel Foundation Coatings Science and Technology Centre (CoaST), University of Manchester
Pages: 78-84
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: Carbon
Volume: 132
ISSN (Print): 0008-6223
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 6.76 SJR 2.226 SNIP 1.666
Web of Science (2017): Impact factor 7.082
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 6.49 SJR 2.091 SNIP 1.648
Web of Science (2016): Impact factor 6.337
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 6.53 SJR 1.988 SNIP 1.71
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 6.62 SJR 2.132 SNIP 1.976
Web of Science (2014): Impact factor 6.196
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 6.54 SJR 2.289 SNIP 2.114
Web of Science (2013): Impact factor 6.16
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 5.95 SJR 2.518 SNIP 2.102
Web of Science (2012): Impact factor 5.868
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 5.23 SJR 2.193 SNIP 2.048