

Integration of graphene and related materials in anti-corrosion coatings

Tobias Meißner

Thorsten Heissenbüttel, Jörg Hübscher, Andrea Rudolf

Institut für Korrosionsschutz Dresden GmbH,
Gostritzer Straße 65, 01217 Dresden, Germany

tobias.meissner@iks-dresden.de

Graphene and related materials (GRM) are a very promising material class for a variety of applications. Among them is the integration of GRM into anti-corrosion coatings which should improve the barrier properties of the material against corrosion stimulation factors. First results of incorporated GRM in polyurethane and epoxy coatings prove an enhanced anti-corrosion behaviour of the investigated coatings [1-3]. The idea behind the integration of GRM is to build a physical and/or electrochemical barrier to reduce the penetration or to extend the pathway for water vapour, oxygen or salts.

The first task within our investigations is the development of ways how to integrate different types of GRM into the coating material. We focus on 2K coatings where GRM is added to the resin before the addition of the hardener. The corrosion protection effect of GRM based coatings on steel substrates in comparison to coatings without pigments or standard barrier pigments will be validated in various corrosion tests. Therefore, the resistance against neutral salt spray, water vapour and climate changes with respect to probable adherence loss, blistering, rust creepage and delamination will be validated. Typical methods like pull-off-strength test or cross-cut test are done prior to stress tests and afterwards to assess the coatings (Figure 1). Moreover, free films of the GRM based coatings are produced in order to investigate the water vapour permeability (Figure 2).

References

- [1] B. Ramezanzadeh et al. Carbon 63 (2015), 555-573
 - [2] M. Mo. et al. RSC Advances 6 (2016), 7780-7790
 - [3] B. Ramezanzadeh et al. Corrosion Science 103 (2016), 283-304
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Figures

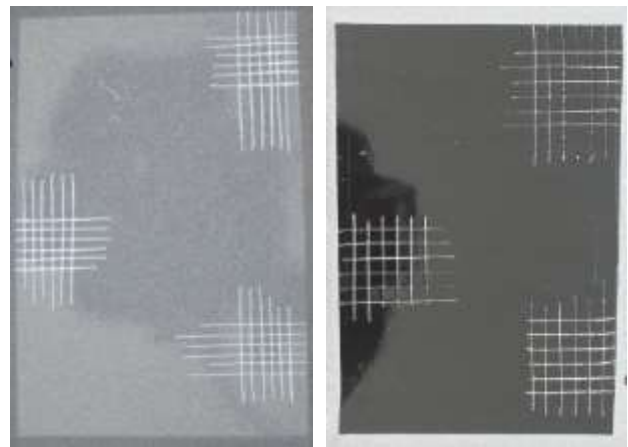


Figure 1: Comparison of PU coating without (left) and with graphene oxide (right) after assessment by means of cross-cut test

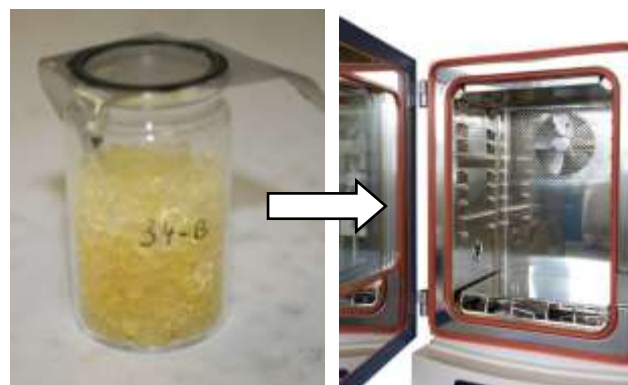


Figure 2: Experimental setup to investigate the water vapour permeability of free films
