Protective coatings based on 2D-materials - DTU Orbit (30/01/2019)

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Corrosion has a major impact on the world economy. Barrier coatings is one of the most widely applied strategies to reduce the degradation of materials, however, every coating technology has its drawbacks. Graphene has the potential of creating the ideal coating, being atomically thin and, when in perfect condition, impermeable to most molecules. However, it has recently been demonstrated that graphene can promote galvanic corrosion and may actually increase the corrosion rate in the long term.

The aim of this thesis is to individuate, develop and demonstrate solutions based on 2D materials, that can deliver viable coatings technologies circumventing the drawback demonstrated for graphene coatings. The focus is twofold, with a solution that focuses on multi-layer coatings, wherein the drawback of graphene is circumvented by diffusion limitations. Here it will be shown that such solutions are viable in pH neutral environments, however, a new issue with graphene coatings is encountered in strong acidic environments. Another focus is on “white graphene”, another 2D-material that shares many of its properties with graphene, but without some of the fundamental limitations.

Through the development and investigations of 2D-coatings technologies, testing methods and synthesis four patents applications have been submitted, making a substantial platform for further development of 2D-based barrier coatings.

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