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A review on the corrosion behaviour of nanomaterials on metallic substrates

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Nanomaterials are innovative materials that have wide applications due to their unique properties. Nanocoating and nanofluids can be prepared utilizing nanomaterials and they have potential applications such as electronics, biomedical, transportation, heat exchangers, optical devices, etc. Fine sizes of nanomaterials and high density of their ground boundaries enable good adhesive properties and excellent physical barrier to the surface of the coated material. Yet, such fine properties might form active sites for corrosion attack. The present paper reviews the work done on the corrosion behaviour of metallic, ceramic and nanocomposite coating on the surface of metallic substrates. It was concluded that there are several factors affecting the corrosion properties of a metallic and ceramic nanocoating depending on the substrate, the nanocoating and/or the surrounding conditions. One or more of these factors contribute to the corrosion behaviour of these nanocoatings: elemental composition of the nanocoating, size and structure of the coated material, type and concentration of the additives, nanocoatings' deposition method and pH of the media. In regard of the nanocomposite coating, synthesis method, kind and concentration of the filler contribute to surface's susceptibility of corrosion attack. In addition to nanocoatings as an application, nanofluids can be utilized as a heat transfer fluid where it will be surrounded with metallic materials as in heat exchangers applications. Therefore, the presence of nanoparticles in these fluids is expected to have an effect on the corrosion behaviour of the metallic materials. It was revealed that no comprehensive work has been done until now and further experimentations need to be conducted in this area.

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