

Graphene coating: A long-life time performance to battery steel

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Recent developments in graphene production offer a wide variety of graphene properties application in the product portfolio of Tata Steel Europe. One of the most demanding nowadays is Ni plated steel for battery applications. However, oxidation of Ni layer is detrimental to its long stability in shelf life performance. Hence TATA Steel developed graphene coatings directly on steel substrates using photo-thermal chemical vapour deposition which provides a long-term protection to Ni plated steel against oxidation under ambient conditions. X-ray photoelectron spectroscopy and High Resolution-Scanning Electron Microscopy analysis study demonstrates that graphene coated Ni surface sustains the initial metallic grain structure (Fig. 1c) reveals an excellent protection of the Ni surfaces after exposure to normal air for more than 24 months while bare Ni surface gets oxidised and provides a rough and highly porous Ni oxide surface structure within first 10 months (Fig. 1b). Our findings suggest that this extremely thin material (up to 20 monolayers) can protect various metallic substrates and highlight the key properties for applications of these materials as an excellent corrosion-controlling coating and moreover offering an enhanced conductivity.

Figures

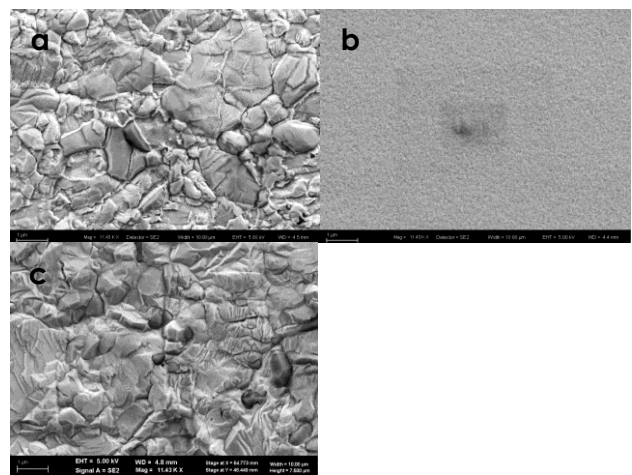


Figure 1: a) Freshly Ni plated steel; b) Ni plated steel after being exposed to normal air for 10 months, c) graphene coated Ni plated steel after air exposure for 24 months.
