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Title: GRAPHITE INTERCALATED POLYANILINE COMPOSITE WITH SUPERIOR ANTICORROSIVE AND HYDROPHOBIC PROPERTIES, AS PROTECTIVE COATING MATERIAL ON STEEL SURFACES

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<AT>GRAPHITE INTERCALATED POLYANILINE COMPOSITE WITH SUPERIOR ANTICORROSIVE AND HYDROPHOBIC PROPERTIES, AS PROTECTIVE COATING MATERIAL ON STEEL SURFACES

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<ABS-Head><ABS-HEAD>Graphical abstract

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<ABS-HEAD>Highlights ► In this paper, it has been utilized a novel method to prepare a new composite material of PANI/NPG graphite composite, using NPG vein graphite variety. ► It is found that the composite works as an anti-corrosive coating on steel surfaces. Further, the prepared composite shows good hydrophobic ability, which is very useful in preventing corrosion on metal surfaces. ► The prepared PANI/NPG composite material shows a significantly high corrosion resistance compared to alkyd resin/PANI coatings or alkyd resin coatings, on steel surfaces.

<ABS-HEAD>Abstract

<ABS-P>Solid polymer composite systems are widely being used for potential technological applications in secondary energy sources and electrochromic devices. In this study, we synthesized and characterized a composite material composed of polyaniline (PANI) and natural needle platy (NPG) vein graphite. Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), cyclic voltammetry (CV), scanning electron microscopy (SEM), X-ray photoelectron spectroscopy (XPS), micro-Raman analysis, thermogravimetric and differential thermal analysis (TGA/DTA), transmission electron microscopy (TEM) were used to study the structural and electrochemical properties of the prepared PANI/NPG graphite composite. XPS, FTIR, and micro-Raman analysis confirmed the existence of relevant functional groups and bonding in the prepared PANI/NPG composite material. The composite shows a very low corrosion rate, approximately 29 μm per year, and high hydrophobicity on steel surfaces, which helps to prevent the corrosion due to O_2 penetration towards the metal surface. It indicates that the composite can be used as a high potential surface coating material to anticorrosion. The specific capacitance of PANI/NPG composite is 833.3 F g^{-1} , which is higher than that of PANI. This synergistic electrical performance result proves the prepared PANI/NPG graphite composite as a suitable protective coating material for steel surfaces.

<KWD>Keywords: PANI/NPG composite; anticorrosion; steel surface; hydrophobicity

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