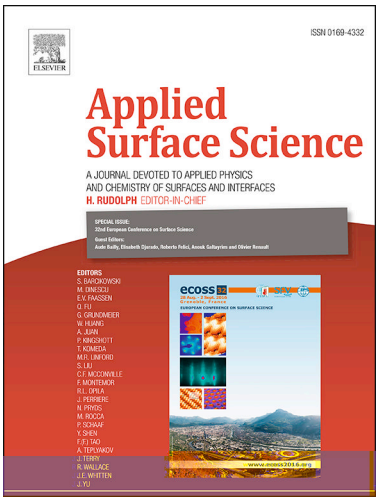

Full Length Article

Electrostatic powder coatings of pristine graphene: a new approach for coating of granular and fibril substrates

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Electrostatic powder coatings of pristine graphene: a new approach for coating of granular and fibril substrates

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Abstract: The use of pristine graphene (pG) based on solution processed coating technologies is often limited by their poor dispersibility in water and organic solvents which prevents to achieve the best performing properties of pG in coating applications. To address these limitations, we developed a dispersant-free coating approach of pG based on their intrinsic solid-lubricity and interlayer electrostatic interactions. The "rotating drum" method was established to provide suitable conditions for electrostatic deposition of pG-powder which is demonstrated on two model substrates with granular and fibril morphologies (urea and acrylic fibers) to improve their physical and electrical properties. The results showed that the pG coating enables to minimize moisture induced caking tendency of commercial urea prills at a relative humidity (RH) of 85% (higher than critical humidity) exhibiting greater moisture rejection ability (~2 times higher than uncoated urea) and to improve their anti-abrasive properties. The pG-powder coating applied on nonconductive acrylic fibers provides a stable conductive layer (~0.8 ± 0.1 kΩ/□sq) which made them suitable for using in wearable electronics, sensors and electromagnetic interference (EMI) shielding. The developed coating method for pG-powder based on "rotating drum" is generic, simple, eco-friendly, low-cost, and scalable for broad range of coating applications.

Keywords: pristine graphene, powder coating, granules, fibers, rotating drum