Bio-based Recyclable Antistatic Coatings for Textile Floor Coverings

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Abstract

Electrostatic discharge is especially common in winter due to dry indoor air. It often arises from friction between shoe soles and floor coverings. When the accumulated charge is released on contact with a conductive object, it can cause an unpleasant electric shock, damage electronic devices, and attract dust to plastic surfaces, with low moisture content. In textile floor coverings with synthetic wear layers, vertical dissipation of electrostatic charges is achieved by incorporating antistatic fibers, while horizontal charge distribution is provided by antistatic additives (e.g., potassium formate) in the latex coating. However, this coating has been criticized for several years because it hinders high-quality recycling of textile floor coverings.

The BioAntiStat project addresses this challenge by developing a bio-based, recyclable, and permanent antistatic coating made from polysaccharides. As by-products of the food industry, these polysaccharides are considered eco-friendly and non-toxic and offer great moisture absorption and retention capabilities, binding water even at very low humidity levels, ensuring effective charge dissipation. To achieve permanence, the polysaccharide layer is attached to synthetic fibres via anchor peptides or chemical coupling, forming a robust nanometer-thin conductive layer. In contrast to latex-bound antistatic systems, this coating can be enzymatically removed at the product's end of life, allowing recovery of the single compounds. Beyond floor coverings, the approach demonstrates high potential for automotive, upholstery, technical, and protective textiles, enabling lightweight, sustainable, and recyclable products.

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