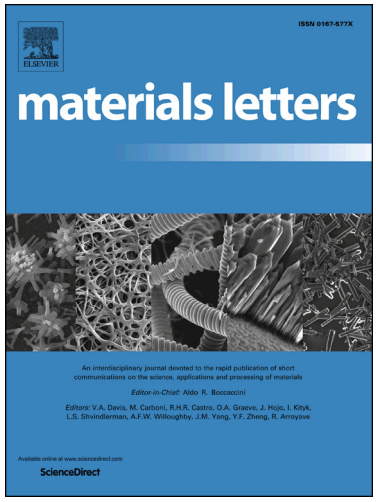

A durable superhydrophobic coating for the protection of wood materials

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A durable superhydrophobic coating for the protection of wood materials

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Abstract

Durable superhydrophobic composite coating of alumina nanoparticles and PDMS was developed to avoid the degradation of wood in humid environment. For this purpose, commercially available alumina nanoparticles were employed to form a rough surface, which was then chemically modified with polydiemethylsiloxane (PDMS) to attain superhydrophobic properties. Several alternate layers of nanoparticles and PDMS were prepared to ensure durable superhydrophobic properties, which were evaluated by emery paper abrasion and water impact tests. The optimized coating was applied on wood substrates to restrict their contact with water. The superhydrophobic character of wood specimens after coating was examined by change in contact angle with time and observing the water absorbance in coated and uncoated wood specimens.

Keywords: Superhydrophobic; Durable; Wood protection; Nanoparticles; Biomimetic

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Introduction

Wood is a versatile composite material containing cellulose, hemicellulose and lignin as its main components. Despite several advantages, the performance of wood is hampered due to its hygroscopic nature and naturally porous structure; it readily interacts with water due to the presence of hydrophilic groups present on its surface and the porous geometry providing channels for the flow of liquids, which causes increased activity of microorganism in the presence of high moisture content and affects the dimensional stability of wood structures [1]. The dilapidation of wood structures can be avoided by restricting their interaction with water, which can be realized by introducing superhydrophobic properties on wood surfaces. Generally superhydrophobic surfaces are prepared artificially by combining the approach of multiscale roughness along with low surface energy [2][3][4][5]. These superhydrophobic surfaces have shown their effectiveness in a variety of fields including oil-water separation