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Antimicrobial coatings and coatings with high water repellency on beech veneer made by APCVDSven Gerullis¹, Pavel Kosmachev², Florian Kettner³, Katharina Plaschkies³, Andreas Pfuch¹, Bernd Gruenler¹¹INNOVENT e.V. Technologieentwicklung, Jena, Germany ²Tomsk State University of Architecture and Building, Tomsk, Russian Federation ³IHD Institut für Holztechnologie, Dresden, Germany

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In this work, an atmospheric pressure plasma chemical vapour deposition (APCVD) technology was used to create thin amorphous silicon dioxide films on beech wood veneer with the aim to achieve antimicrobial and (super-)hydrophobic properties. SiO_x-film-matrices were created by use of a hexamethyldisiloxane (HMDSO) precursor. To achieve antimicrobial properties Ag, CuO or ZnO particles were embedded in the matrices of these films. To obtain hydrophobic properties polydimethylsiloxane and perfluorooctyltriethoxysilane were used as secondary precursors. The morphological and the chemical structure of the layers were investigated by Scanning Electron Microscopy (SEM) as well as by X-Ray Photoelectron Spectroscopy (XPS). The obtained results showed the possibility to create active agent containing films on wood. The antibacterial effect was evaluated by BacTiter-Glo® and by an agar diffusion method. These tests showed for all used agents a strong antibacterial effect against the bacteria strains Escherichia coli (gram-) and Staphylococcus aureus (gram+). Using the mentioned agents apart a significant effect against mould (mould test) could not be achieved against Aspergillus niger DSM 1957, Paecilomyces variotii DSM 1961, Penicillium funiculosum DSM 1944 and Trichoderma viride DSM 1963. The situation is changed when the agents were combined and the growing silicon oxide layer contained more than one active agent. In this case fungicide behaviour could be detected, too. With view on water-repellent coatings on wood we were able to produce highly hydrophobic coatings. Water contact angle measurement showed that the contact angle against water can reach 160° with low sliding angles. Moreover, resistance of the coatings against abrasion in accordance to ASTM D2486 and the leaching behaviour were tested, and the results demonstrated that the surface coatings were stable.

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