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The adsorption of silver on lignin and its precursors

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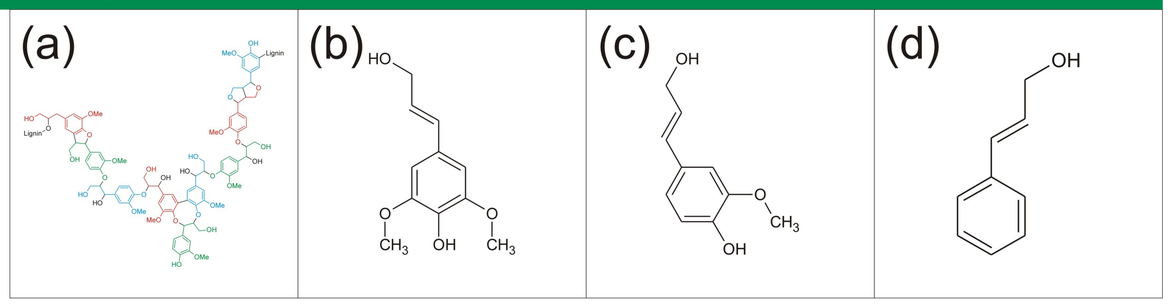
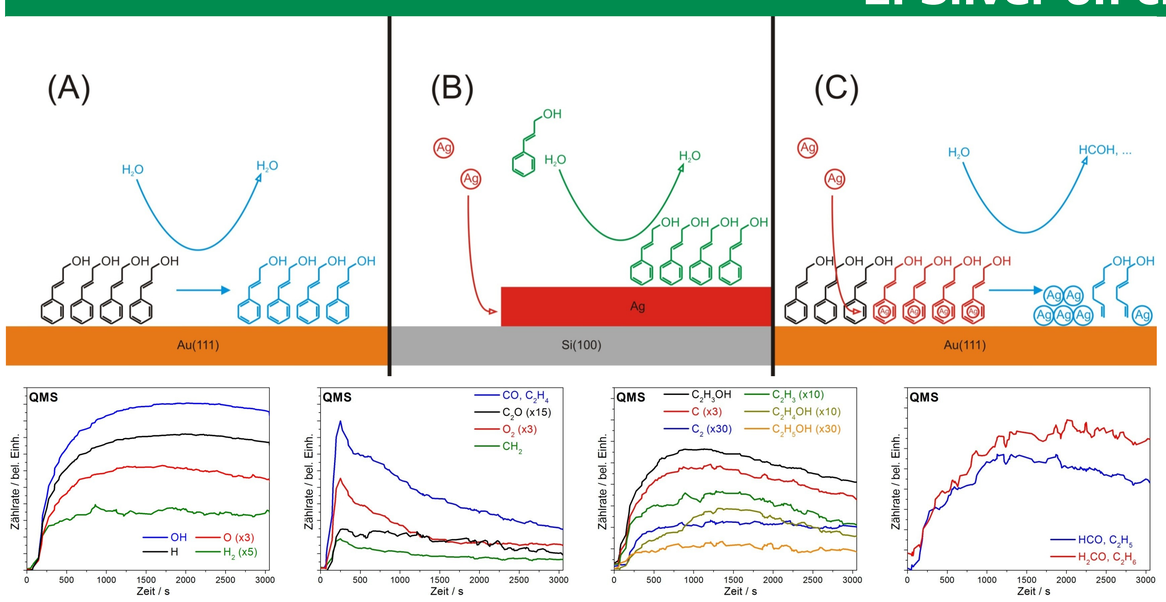
1. Introduction

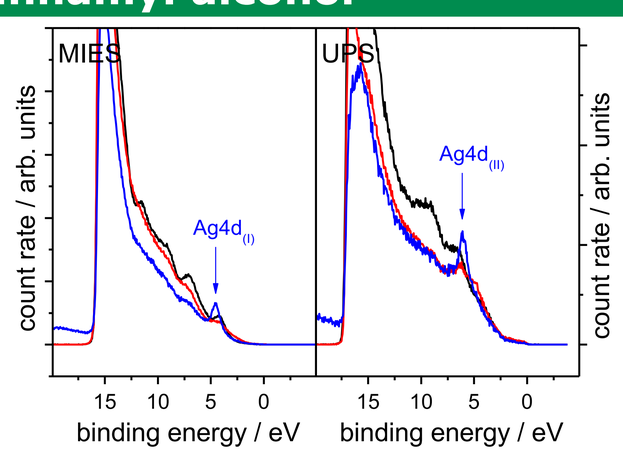
The adsorption of silver on lignin is of great interest for the modification of wood surfaces with antibacterial coatings. The natural precursors during the biosynthesis of lignin (a) are mainly the monolignols sinapyl alcohol (b) and coniferyl alcohol (c) [Vanholme]. These have been used as model systems to get a better understanding of the interaction of silver with lignin. The biosynthesis involves cinnamic acid as intermediate [Vanholme], thus cinnamyl alcohol (d) was used as additional model system. X-ray Photoelectron Spectroscopy (XPS), Ultraviolet Photoelectron Spectroscopy (UPS), Metastable Induced Electron Spectroscopy (MIES) and Atomic Force Microscopy (AFM) have been employed during the investigations.

(a) (b) (c) (d)

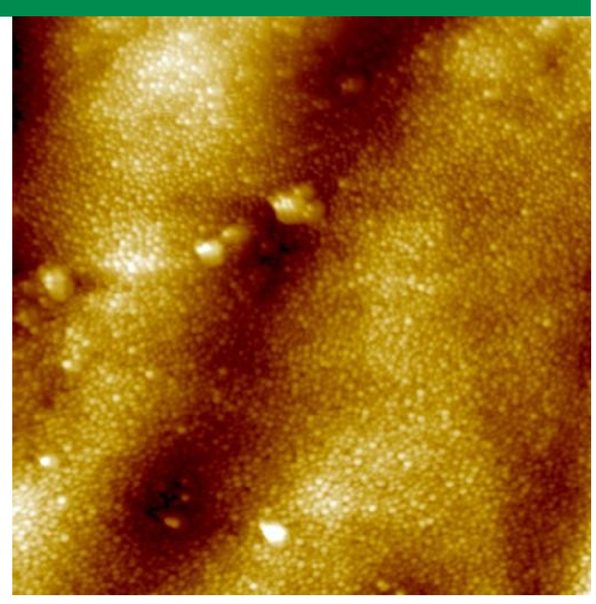


2. Silver on cinnamyl alcohol

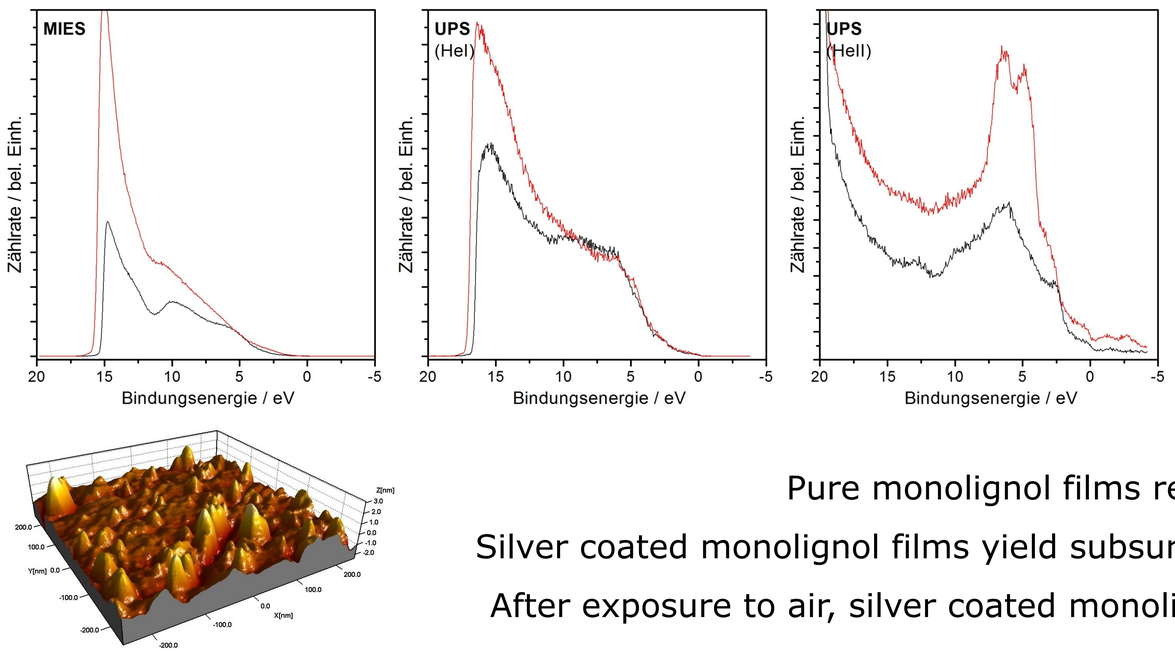




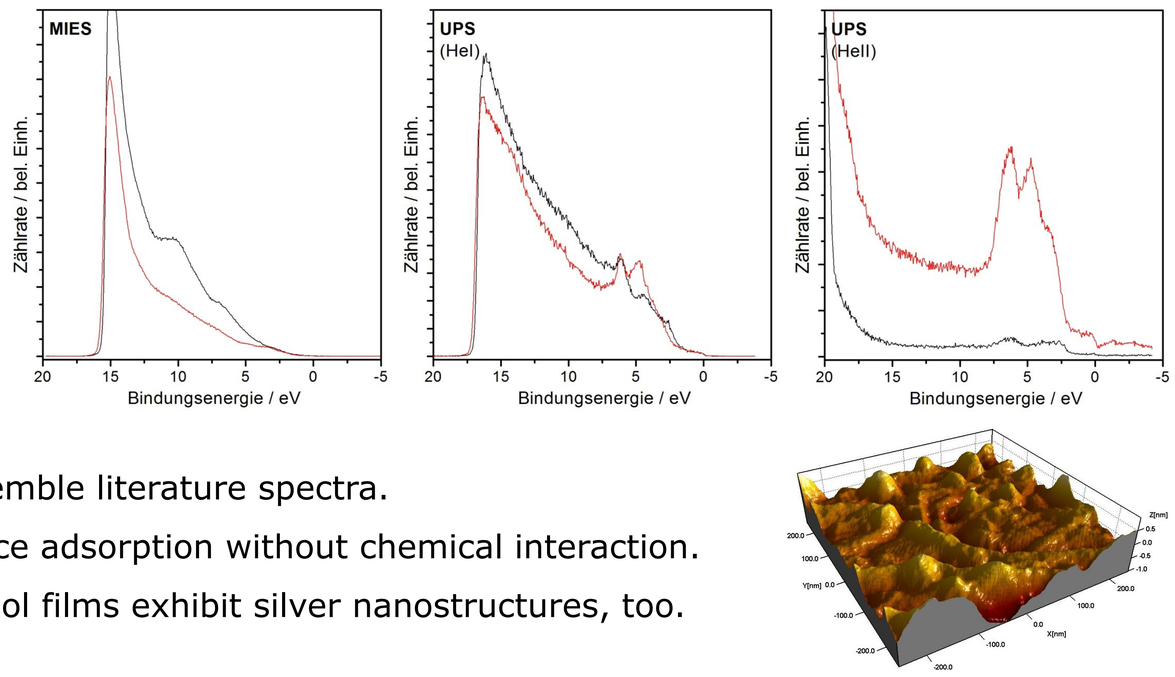
Catalytic decomposition during water exposure only for silver coated cinnamyl alcohol!



3. Silver on coniferyl alcohol



4. Silver on sinapyl alcohol

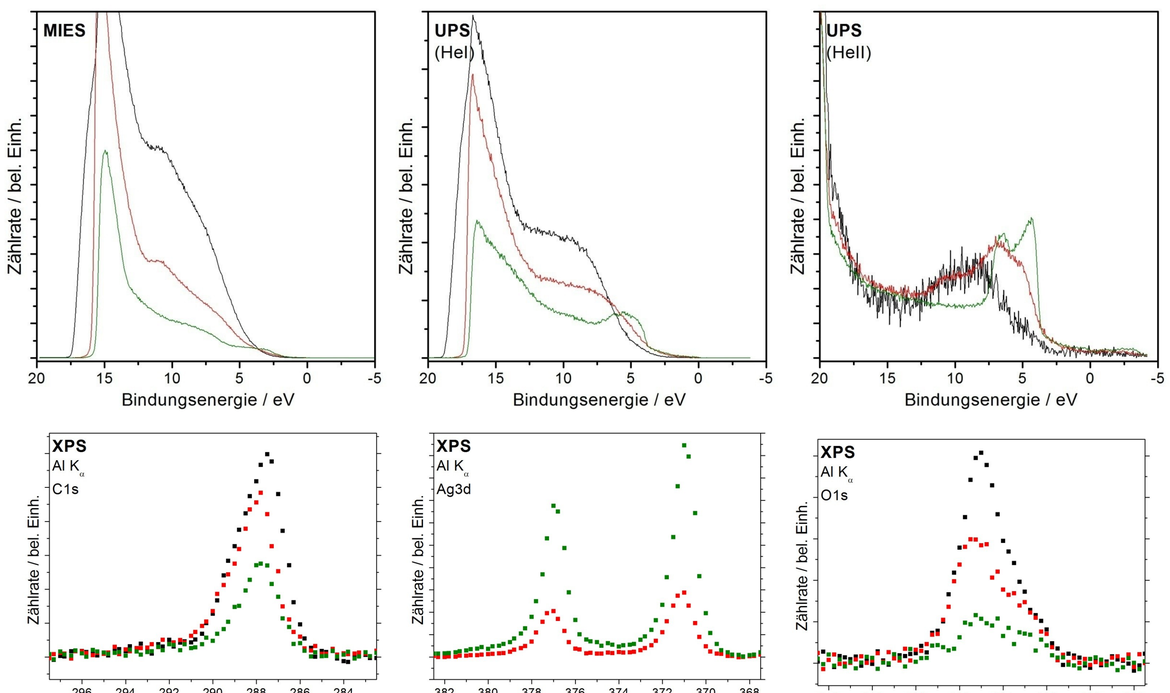


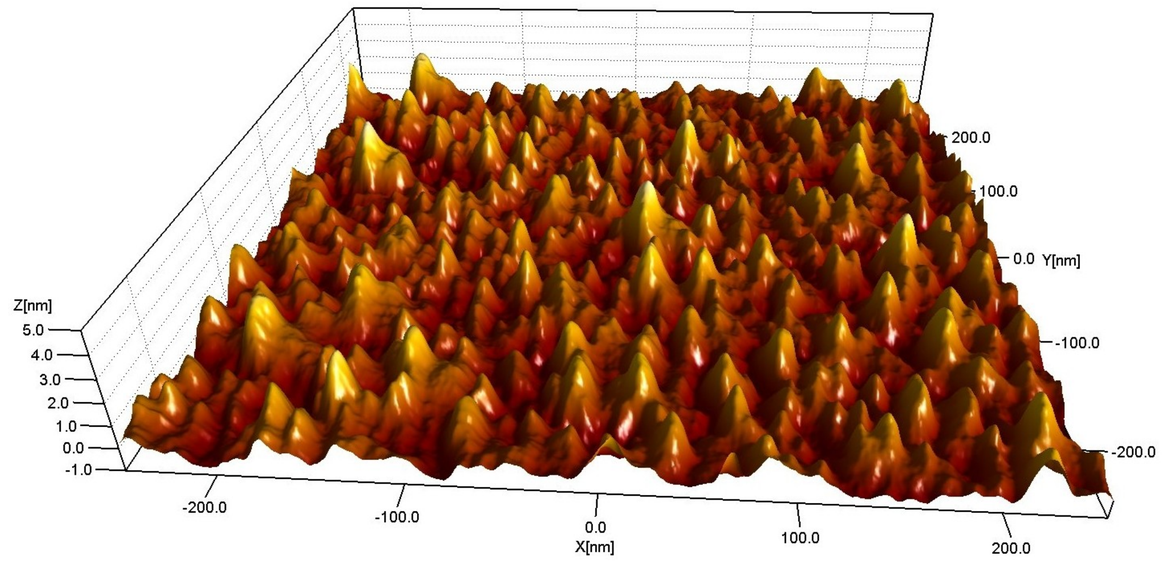
Pure monolignol films resemble literature spectra.

Silver coated monolignol films yield subsurface adsorption without chemical interaction.

After exposure to air, silver coated monolignol films exhibit silver nanostructures, too.

5. Silver on lignin





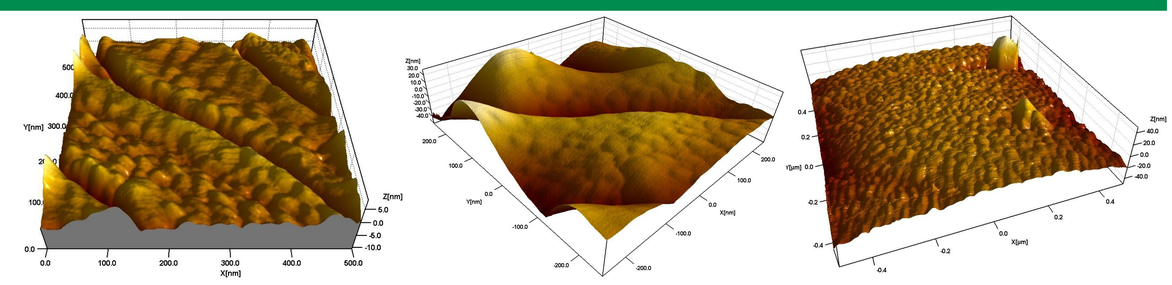
More amounts of silver needed spin-coated lignin films than on thermal evaporated monolignol films.

Again, we find subsurface adsorption of silver and nanoparticle formation during contact with air.

6. Outlook

Silver coated cellulose shows no decomposition during air contact.

Silver coated pine wood veneer chips reveal nanoparticle formation after air contact just as lignin.



7. Acknowledgements

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Atom- und Molekülphysik an Oberflächen