# LOTUS EFFECT NA DRVNO-CEMENTNIM PLOČAMA
# LOTUS EFFECT ON THE WOOD-CEMENT BOARDS

Sveučilište u Zagrebu Fakultet kemijskog inženjerstva i tehnologije
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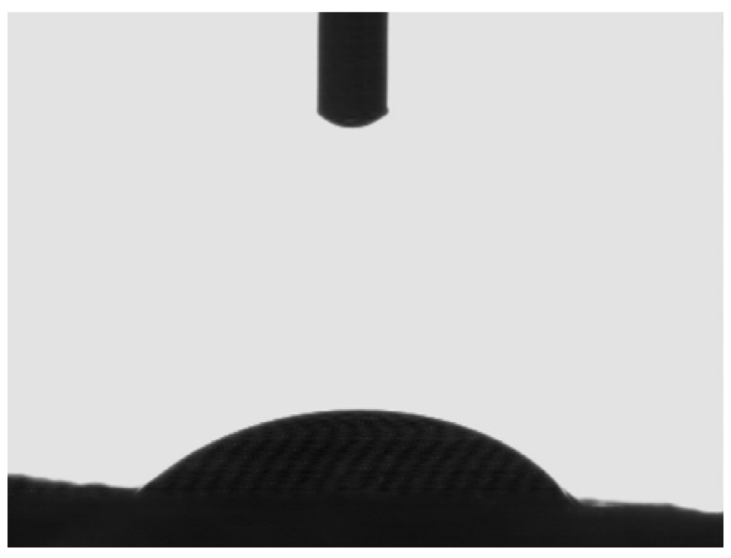
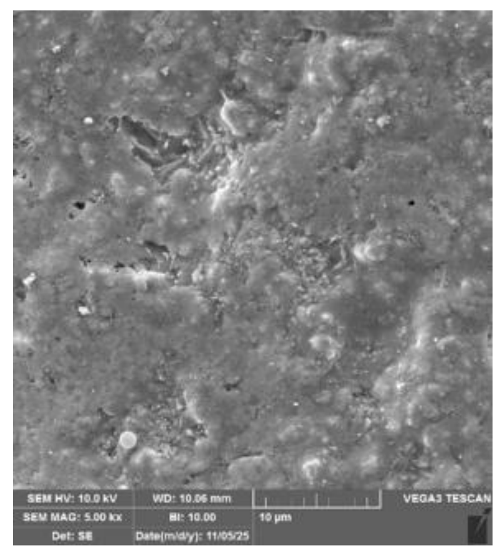
Wood-cement boards are a porous composite material consisting of an inorganic Portland cement binder mixed with wood wool as reinforcement. In construction, they are used for thermal and sound insulation due to their low density, high porosity, fire resistance, and compatibility with other building materials. [1] The cement-rich surface of wood-cement boards is highly hydrophilic, necessitating surface protection to enhance resistance to moisture and UV-induced degradation, particularly in exterior applications. Coatings such as mineral (silicate) and water-based low-VOC (volatile organic compound) formulations, as well as traditional lime coatings, are commonly used to enhance surface hydrophobicity.[2]

## 1. Uncoated sample

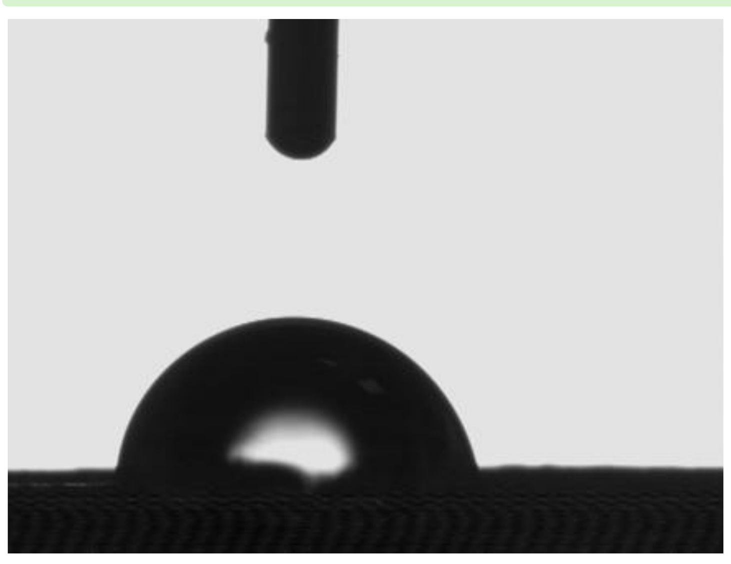

1a) Sample of wood-cement boards

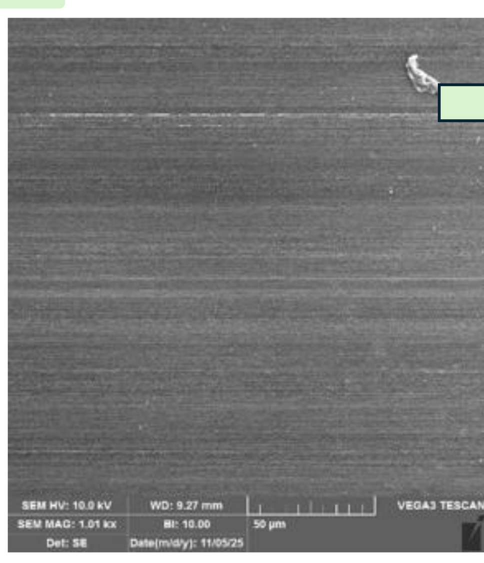

1b) A drop of water on the surface of a sample under a microscope (contact angle of 51.3° ± 2.4)


1c) SEM image of the uncoated sample surface

To coat the wood-cement boards, five products were selected according to the following criteria: water resistance, water vapor permeability (diffusivity), environmental friendliness (water-based formulation with low VOC content), durability, and resistance to UV radiation and weathering. The morphology of the modified board surfaces was examined using scanning electron microscopy (SEM), and hydrophobicity was assessed by contact angle measurements.

## 2. Sample coated with Xyntra


2a) A drop of water on the surface of a sample Xyntra under a microscope

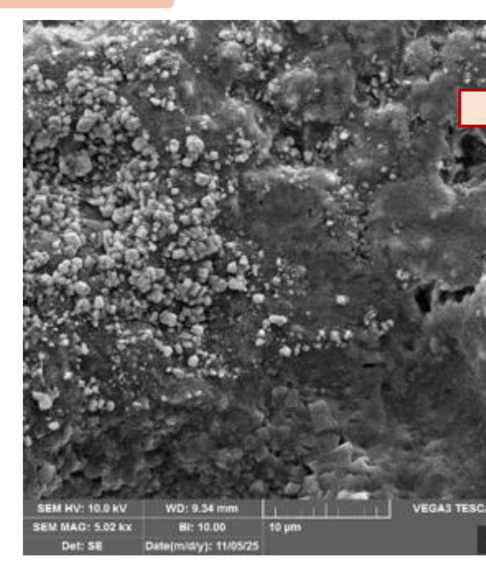

2b) SEM image of the Xyntra sample surface

Contact angle:
**85.1° ± 3.7**

SEM: Homogeneous surface; the coating thoroughly covered the original surface, making it impossible to see the original morphology

## 3. Sample coated with Nanowood

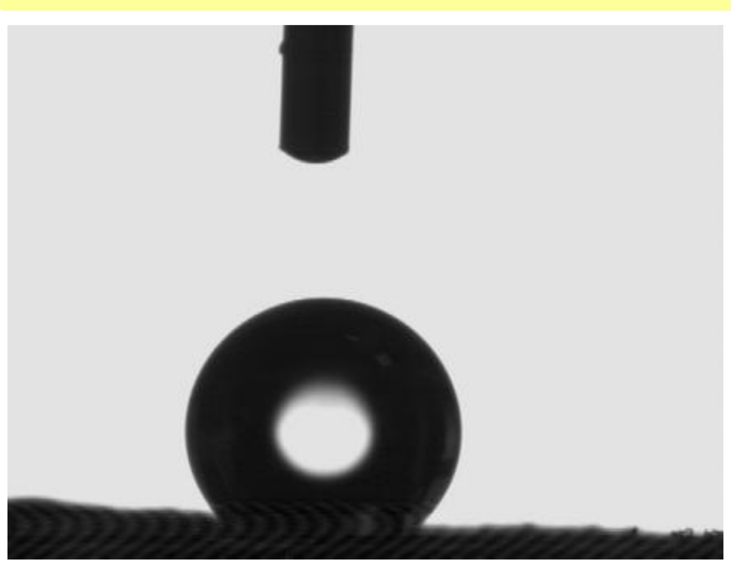

3a) A drop of water on the surface of a sample of Nanowood under a microscope

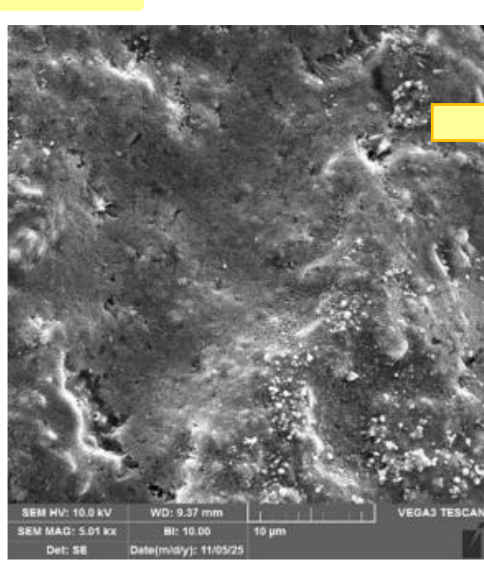

3b) SEM image of the Nanowood sample surface

Contact angle:
**128.4° ± 3.4**

SEM: Heterogeneous surface with agglomerated particles of cement hydration products, but also formed crystallites of the applied coating

## 4. Sample coated with Nanostone

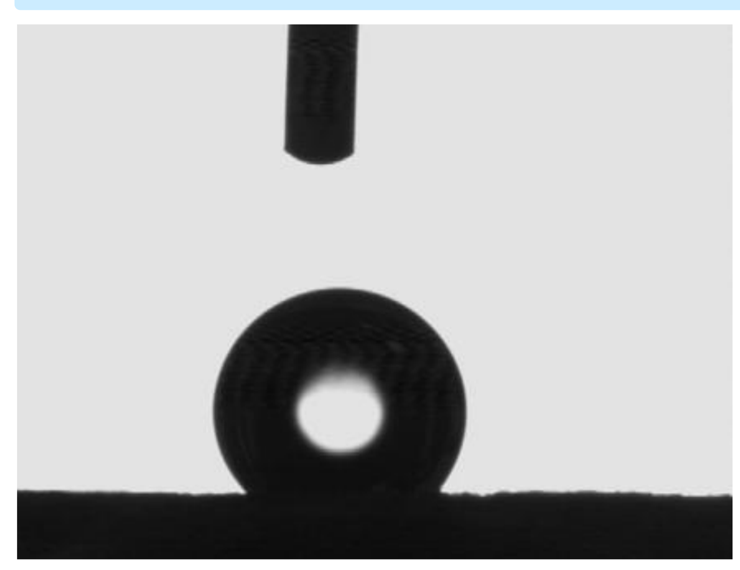

4a) A drop of water on the surface of a sample of Nanostone under a microscope

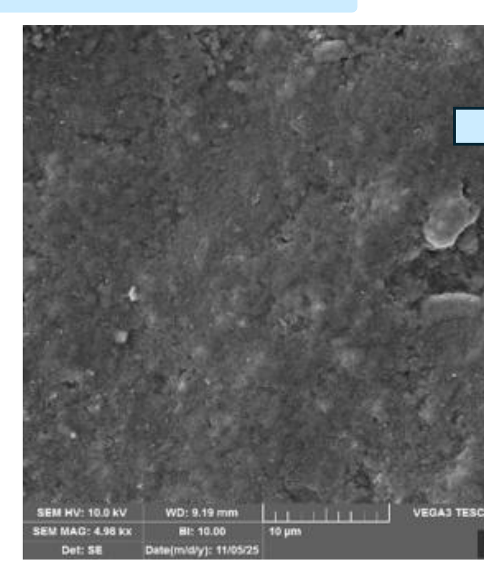

4b) SEM image of the Nanostone sample surface

Contact angle:
**132.1° ± 2.6**

SEM: Heterogeneous surface with agglomerated particles of cement hydration products and small crystallites formed in the applied coating

## 5. Sample coated with WRW5 for woods

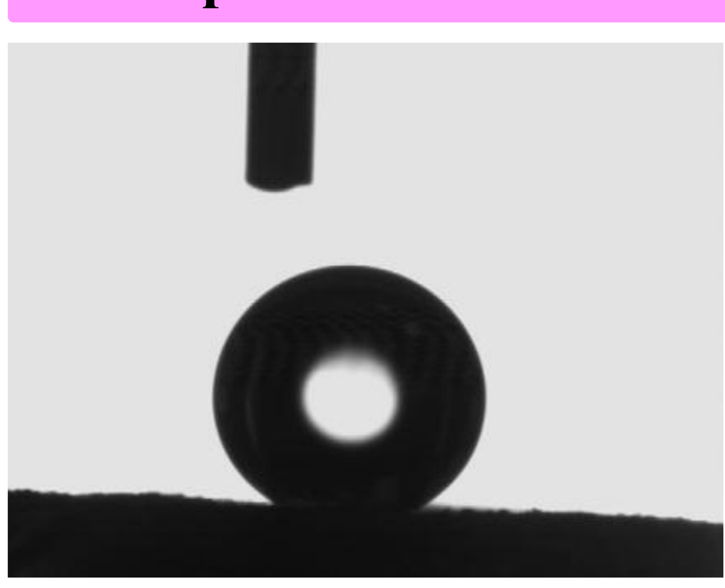

5a) A drop of water on the surface of a WRW5 sample under a microscope

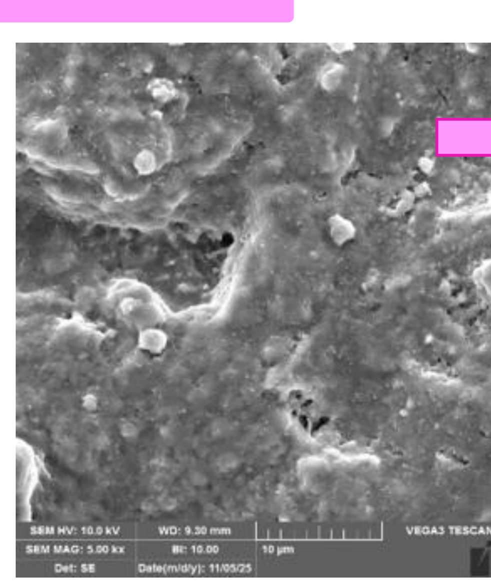

5b) SEM image of the WRW5 sample surface

Contact angle:
**134.6° ± 3.1**

SEM: Heterogeneous surface with agglomerated particles of hydration products of cement, without additional crystallites from nano-sized coating

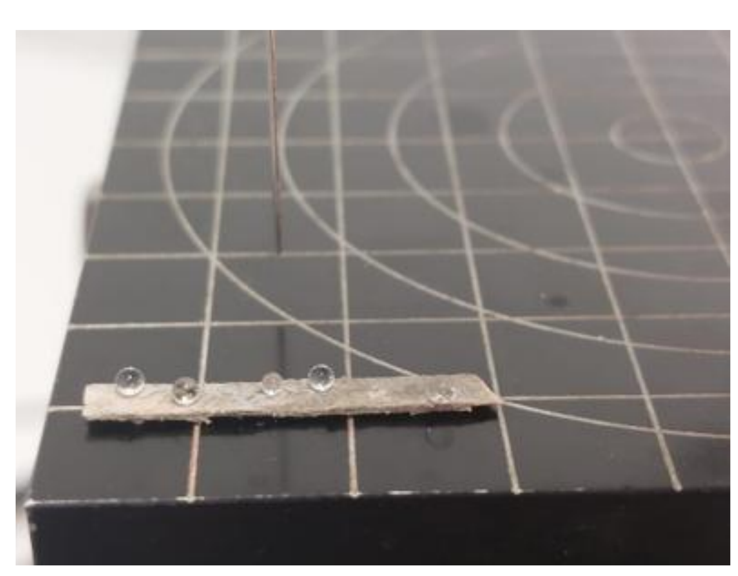
## 6. Sample coated with BW3 for stones

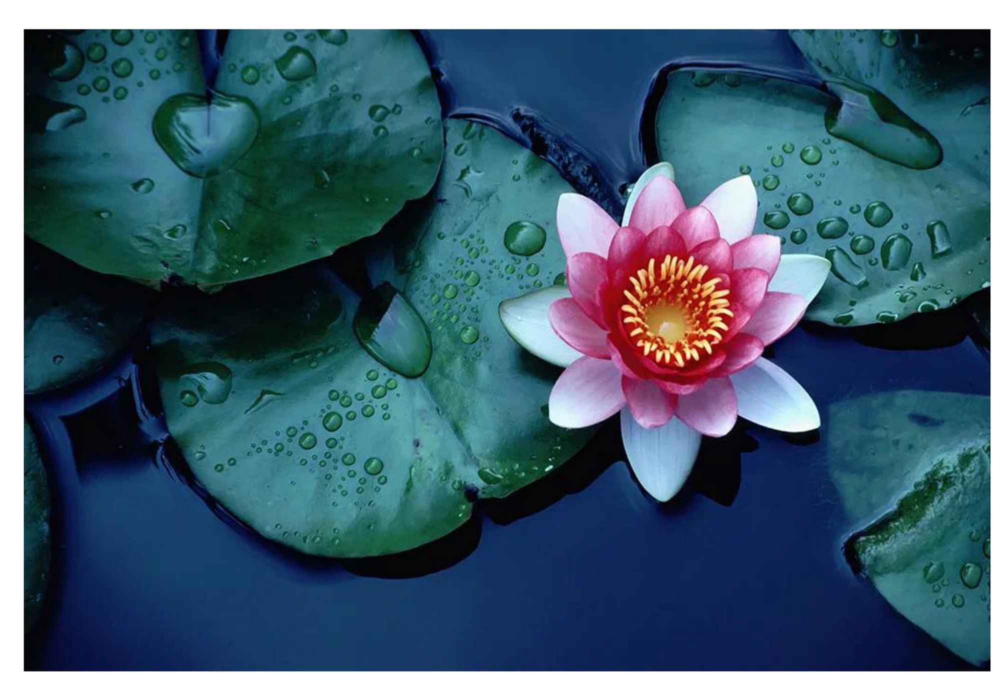

6a) a drop of water on the surface of a sample BW3 under a microscope


6b) SEM image of the BW3 sample surface

Contact angle:
**153.2° ± 3**

SEM: Heterogeneous surface with agglomerated particles of hydration products of cement, without additional crystallites from nano-sized coating


6c) Display of a sample on which water droplets have been applied, prepared for recording the contact angle


6d) Photo of lotus

**Conclusion:** The modified wood-cement boards retained their original heterogeneous surface morphology, characterized by a non-uniform distribution of cement binder and exposed wood fibers, owing to the application of a thin, transparent coating layer. All coatings improved the surfaces' hydrophobic performance, with some samples exhibiting contact angles exceeding 150°, indicating superhydrophobic behavior associated with the Lotus effect.



[1] A. B. Radwan et al., Ind. Eng. Chem. Res. 64 (2025) 10609–10640.
[2] A. Donmez Cavdar et al., Constr. Build. Mater. 142 (2017) 410–416.

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