Effectiveness of Two Different Hydrophobic Topcoats for Increasing of Durability of Exterior Coating Systems on Oak Wood

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WHY COATINGS ON OAK WOOD?

Oak wood (*Qercus patreae*, L):

+ durable against bio-attack,
+ interesting colour and wood texture,

- leaching of exctractives by rain causing pollution,
- shorter durability of exterior coatings due to its specific structure and extractives content.

OBJECTIVES

» Evaluation of the efficiency of transparent and semi-transparent coating systems applied on oak wood.

» Possible enhancement of coating systems durability by application of hydrophobic layers.

MATERIALS AND METHODS

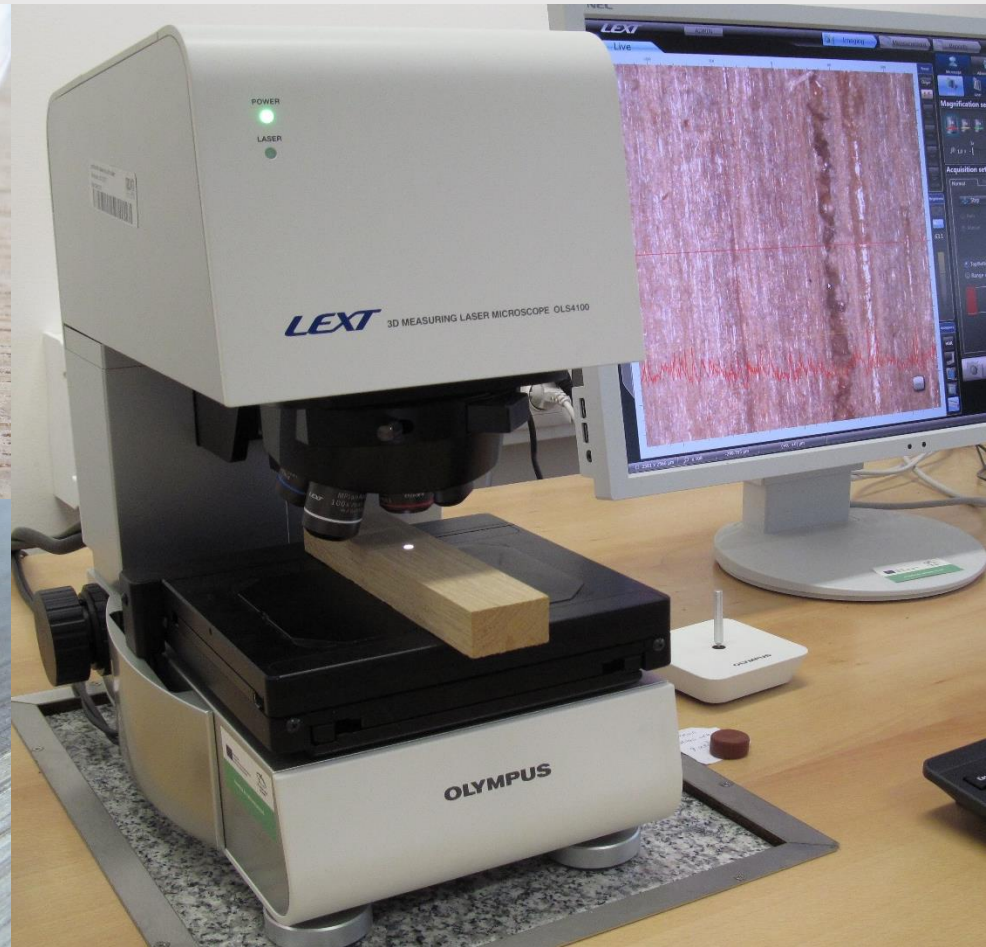
» oak wood (*Qercus patreae*, L.)

» 24 transparent and semi-transparent coating systems on OIL (OL), ACRYLATE (AC), ALKYD (AL) and other SYNTHETIC (SL) polymer base

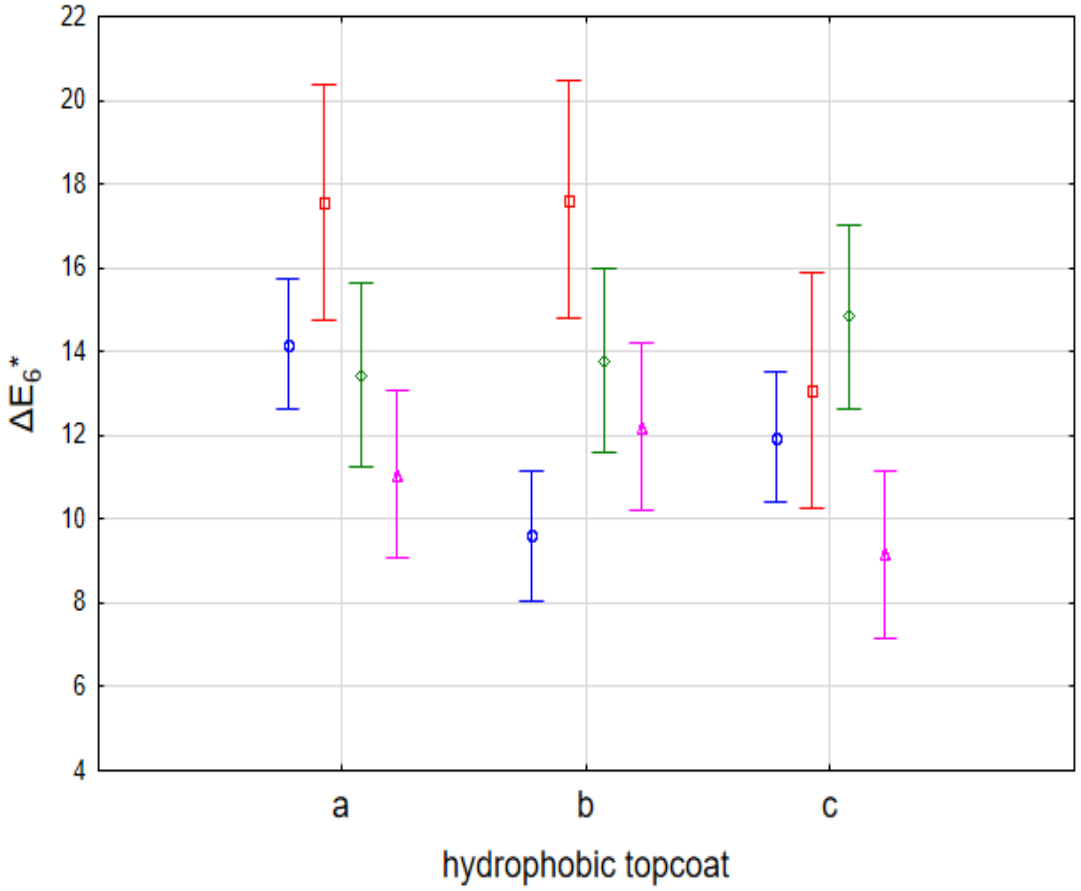
» coatings without (a) or with 2 hydrophobic topcoats: SYNTHETIC (b) and ACRYLATE (c)

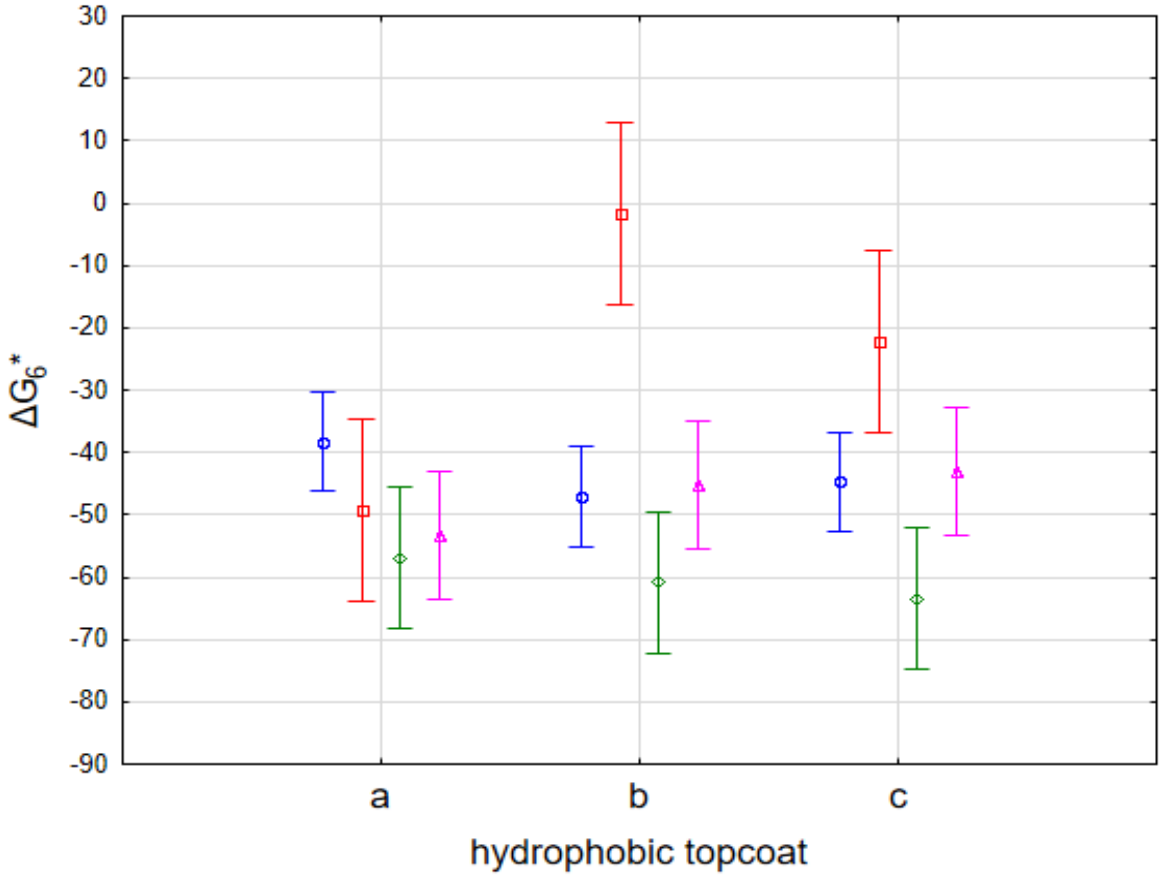
METHODOLOGY

» artificial weathering together with temperature cycling
» regular evaluation of color, gloss and contact angle change
» visual evaluation (confocal laser scanning microscopy)



RESULTS

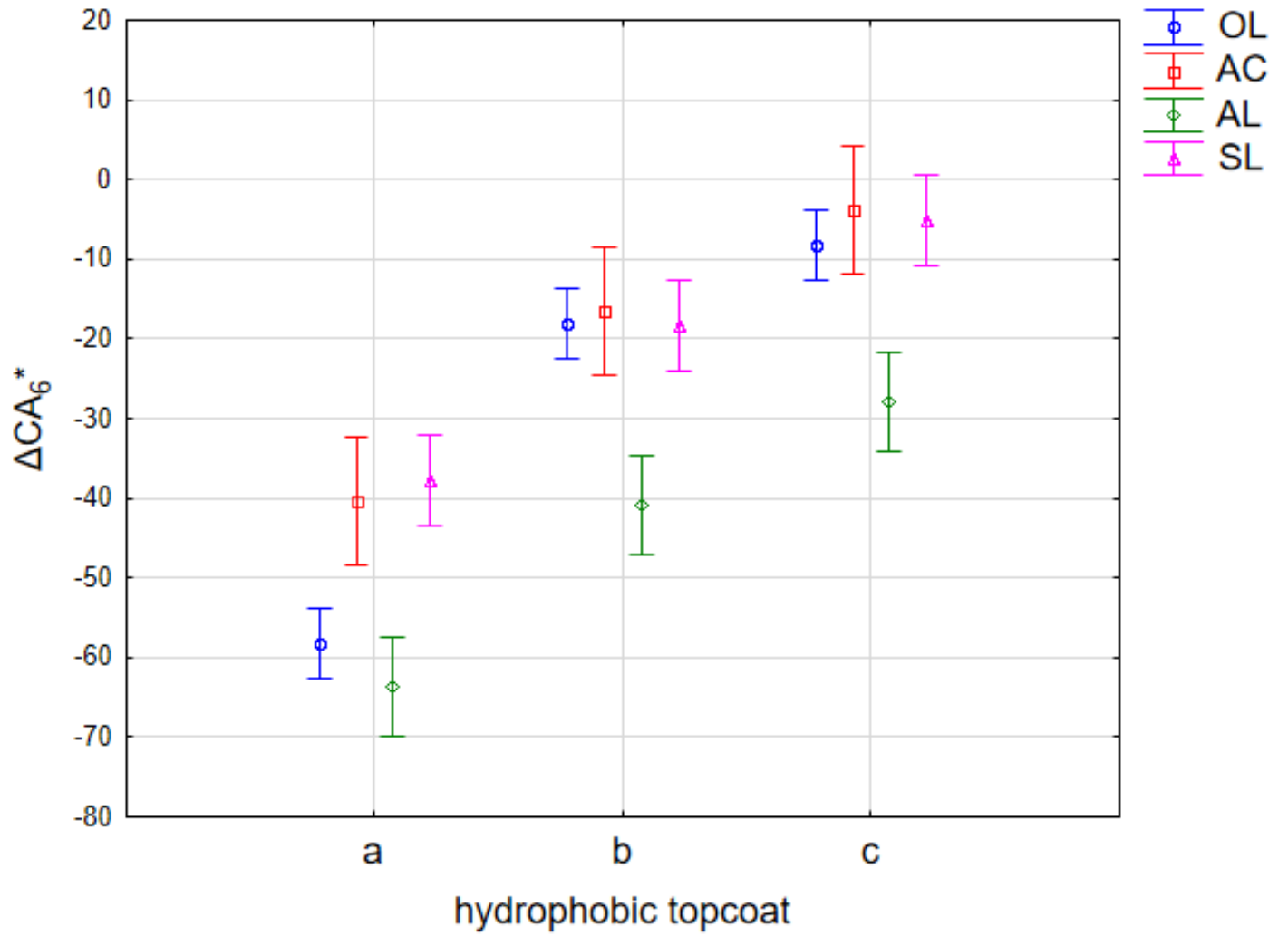




OL AC AL SL

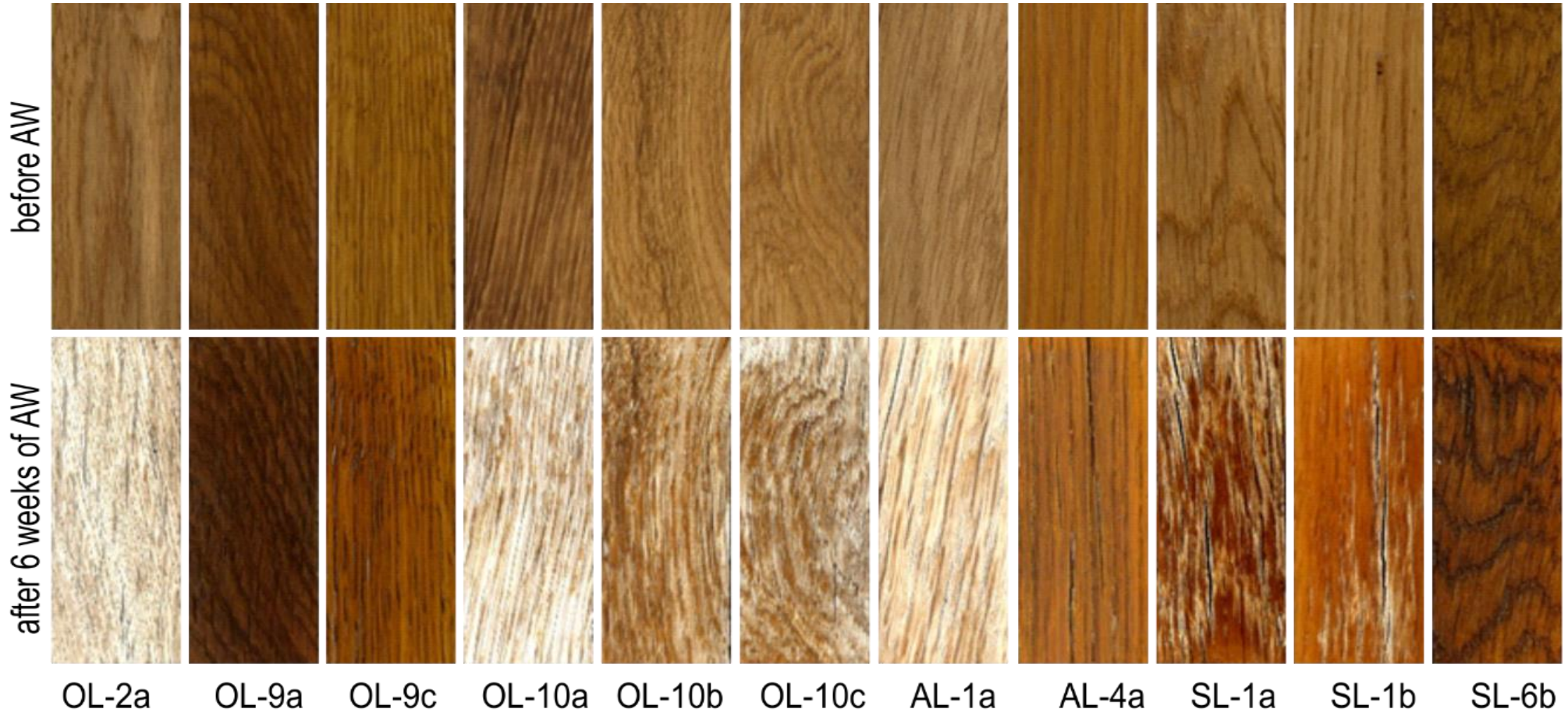
Efficiency of hydrophobic layer on the color and gloss change after 6 weeks of AW

RESULTS



Efficiency of hydrophobic layer on the contact angle change after 6 weeks of AW

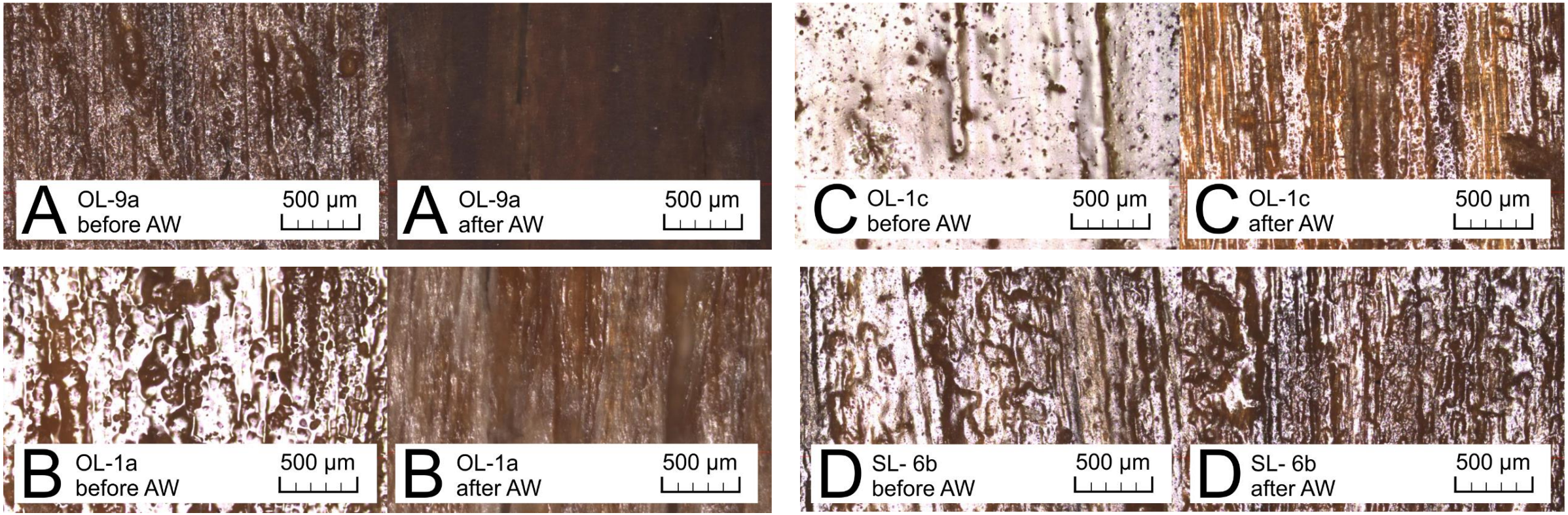
RESULTS



Visual changes of selected tested coating systems on oak wood

OL-2a: Penetrating transparent oil - the same degradation was observed using hydrophobic treatments b and c;
OL-9: Semitransparent oil creating thin layer - positive effect of hydrophobic treatment (c) on color stability of AW samples;
OL-10: Semitransparent penetrating oil - partly positive effect of hydrophobic topcoat application b and c;
AL-1: Transparent alkyd paint - very similar degradation was observed using hydrophobic treatments b and c;
AL-4: Semitransparent alkyd coating - positive effect of pigment content increasing its durability (in comparison with transparent AL-1a);
SL-1: Transparent synthetic coating - positive effect of application of topcoat b;
SL-6b: Semitransparent synthetic coating - positive effect of application of topcoat b.

RESULTS



Microscopic changes (using confocal laser scanning microscopy) of coating surfaces

OL-9a (A), OL-1a (B), OL-1c (C) and SL-6b (D) before (left) and after 6 weeks of AW (right). It is possible to see loss of gloss and color changes of OL-9a, but coating layer is not degraded (A); Positive effect of hydrophobic top coat (c) application on OL-1 is visible (B and C); Good durability of SL-6b after AW – only darkening is visible, surface is relatively unchanged.

CONCLUSIONS

- Selection of the coating system can both **positively and negatively** affect the overall service life of oak wood in exterior.
- Semi-transparent coating systems were **more stable** than transparent ones.
- The topcoat with hydrophobic additives in the **acrylate water base**: more appropriate for application on tested oak wood coatings in comparison with synthetic hydrophobic topcoat.
- Top **hydrophobic layer improved** mainly the properties of oil and partially acrylate coatings.
- Further research needed for oak wood.

Thank you for your attention!

PICTURES FROM:

» www.pexels.com

» Photos by: Eliška Oberhofnerová, Miloš Pánek