Corepan Bois
Consortium de recherche sur les panneaux composites à base de bois

UNIVERSITÉ LAVAL

Development of an anti-fingerprint coating for melamine laminated particleboard surfaces

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Introduction

Melamine-laminated particleboard is extensively used in furniture and interior design due to its cost-effectiveness and attractive appearance. However, its surfaces are prone to be easily marked by fingerprints (from oils and sweat), which adhere to the material, diminishing its visual appeal, increasing the need for cleaning, and shortening the lifespan of the furniture in high-traffic areas such as hospitals, kitchens, and public spaces. While solutions such as chemical surface treatments have been proposed to address the issue of fingerprint marks, these methods have proven ineffective over the long term.

→ There is a need for an anti-fingerprint (oleophobic and hydrophobic properties) coating that could reduce the visibility of fingerprint marks on coated surfaces by repelling water and oil. The prepared coating should equally improve the surface's mechanical properties, better aesthetic appeal, reduce cleaning time, and be eco-friendly.

Objective

The main goal of this work is to develop an anti-fingerprint (hydrophobic and oleophobic properties) coating on melamine laminated particleboard surfaces with improved mechanical properties, durability, eco-friendliness, aesthetic appeal, and ease of cleaning.

Methodology

Five thermally fused laminated panels were examined and their surfaces were characterized using different techniques.

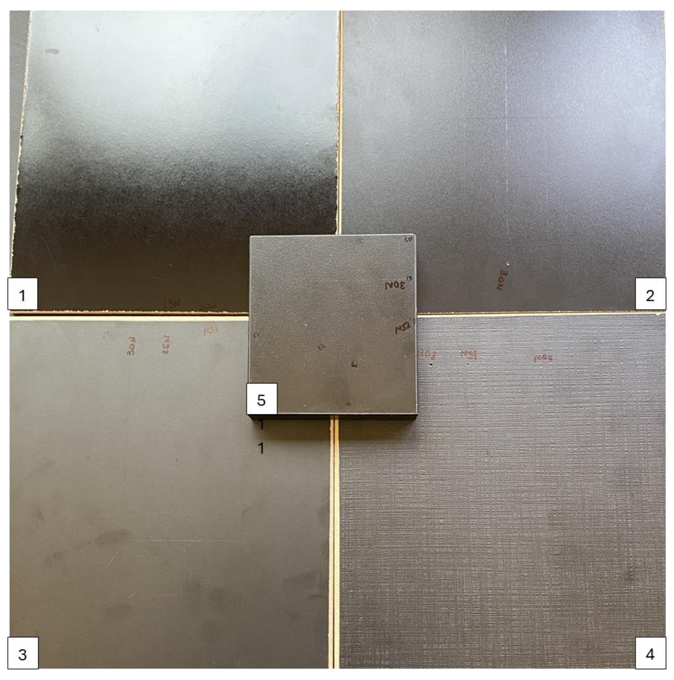


Figure 1: Images of panels 1, 2, 3, 4, and 5

Chemical resistance evaluation (ASTM D1308):

- The test was conducted for 24 hours using ketchup, canola oil, bleach, water, vinegar, and coffee.
- The evaluation was based on architectural wood standards (scale of 1-5) based on surface changes.

Contact angle measurement:

- A goniometer was used to determine the hydrophobic/oleophobic properties of the surfaces using different liquids (water, hexadecane, and diiodomethane) through contact angle.

Surface roughness evaluation

- A profilometer was used to analyze the surface roughness (surface topography) of the different panel surfaces and their Sa was obtained.

Results

Table 1: Chemical resistance evaluation

Panels	ketchup	coffee	bleach	vinegar	canola oil	water
Panel 1	5	5	5	5	5	5
Panel 2	5	5	5	4	1	5
Panel 3	5	5	5	4	1	5
Panel 4	5	4	5	1	1	5
Panel 5	5	5	5	5	2	5

5-No effect
4- Minimised effect
3- Noticeable change
2-Moderate effect
1-Poor performance

- Panel 4 showed the poorest resistance to the different liquids applied.
- All the panels except panel one were stained with the canola oil. Thus, the panels showed an average resistance to the applied liquids as seen above.

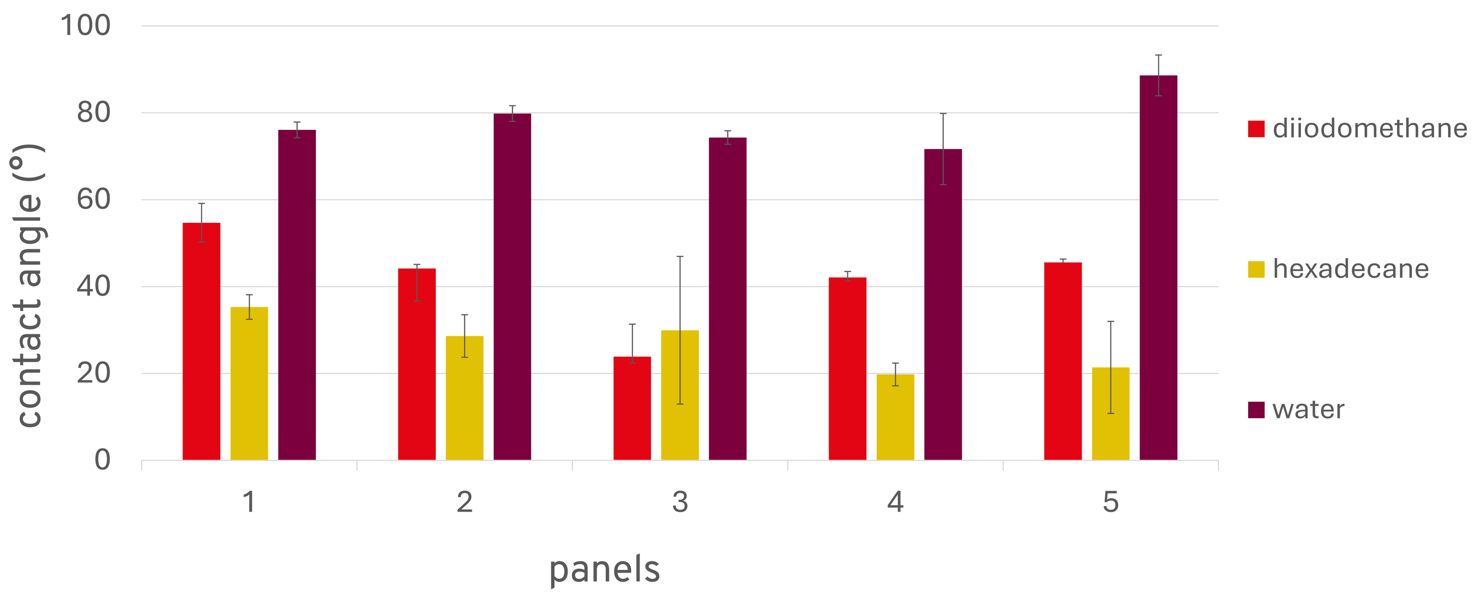
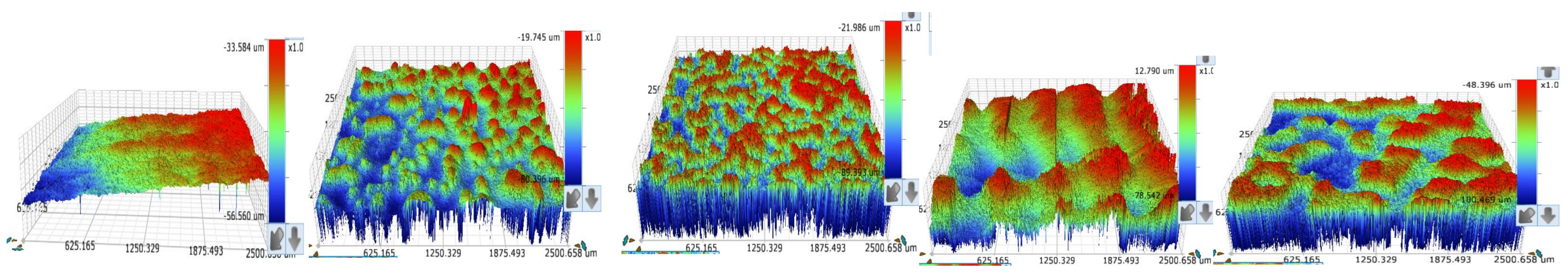


Figure 2: Contact angle measurements of examined panels with water, hexadecane, and diiodomethane

- Panel 5 showed the highest water contact angle, as seen above, which suggests that it performs slightly better than the other panels with lower angles observed.
- None of the panels showed an oleophobic property since oleophobicity requires an oil contact angle of 105°. Thus, further surface modification is needed to enhance ant-fingerprint properties.

Surface roughness evaluation



P1 P2 P3 P4 P5

Table 2: Surface roughness (S_a) evaluation

Panels	P1	P2	P3	P4	P5
Surface roughness (µm)	0.49±0.06	2.64±0.01	3.23±0.03	11.47±1.42	3.73±0.18

- Panel 1 showed a smooth surface with the lowest surface roughness value, while panel 4 showed the highest surface value, indicating a more rough surface.

Conclusion and perspective

Hydrophobic and oleophobic properties rely on the contact angle between the panel surface and the examined liquid or solvent used since anti-fingerprint coatings should be water and oil-repelling. Anti-fingerprint property does not depend entirely roughness of a surface since we can achieve a high contact angle on a smooth surface and a low contact angle on a very rough surface. Thus, surface roughness is not directly related to anti-fingerprint coating performance.
In enhancing hydrophobic and oleophobic properties, increasing the contact angle is a key factor. Thus, future results should demonstrate a high contact angle for better hydrophobic and oleophobic properties.

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