4° ICAP Project Meeting

Project status Wood Kplus

INNOVA FVG

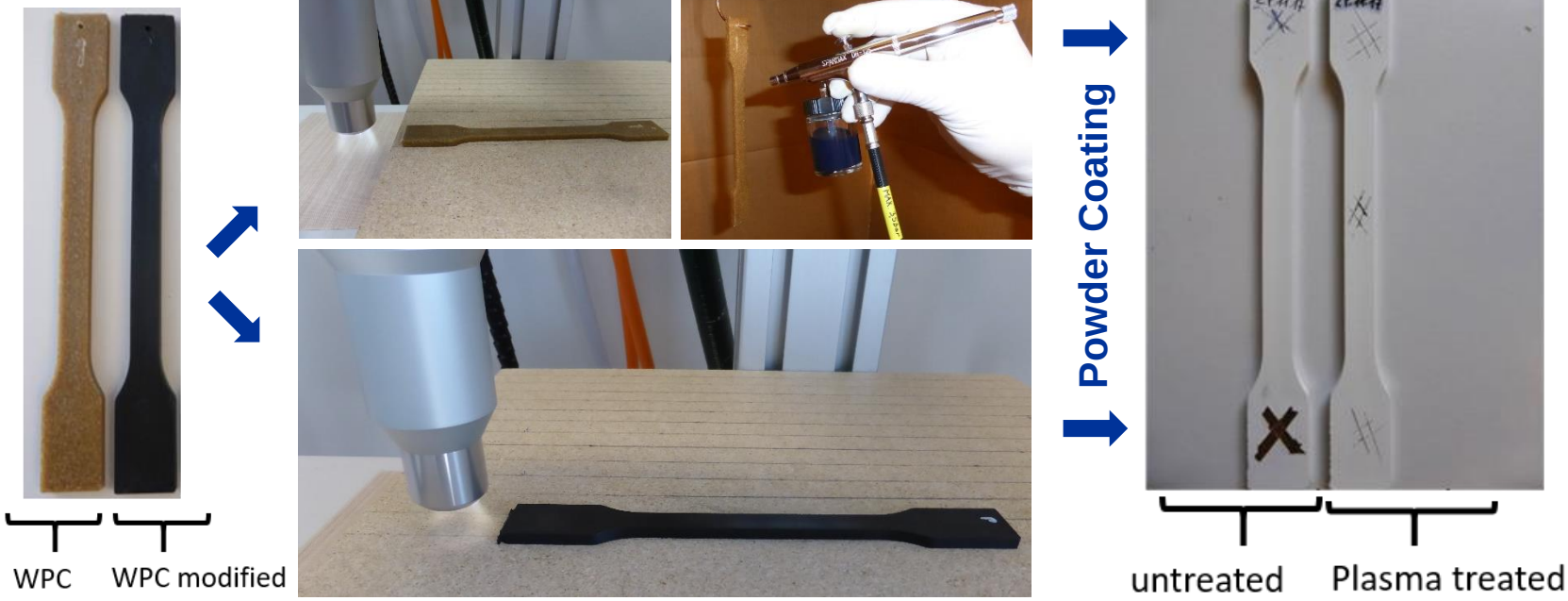
Amaro/Udine, 14.02.2018

Experiments

Plasma treatment of WPC boards for a subsequent powder coating II

(a) Plasma treatment of WPC and coating with a conductivity solution

(b) Plasma treatment of modified WPC (including conductivity additives)



Experiments

Experiments using plasma treated powder coatings

Powder coatings were treated using low-pressure plasma (Diener Plasma GmbH) with the objective to achieve an activation of the powder coatings and thereby an optimization of the levelling properties during the coating process.

Experiments:

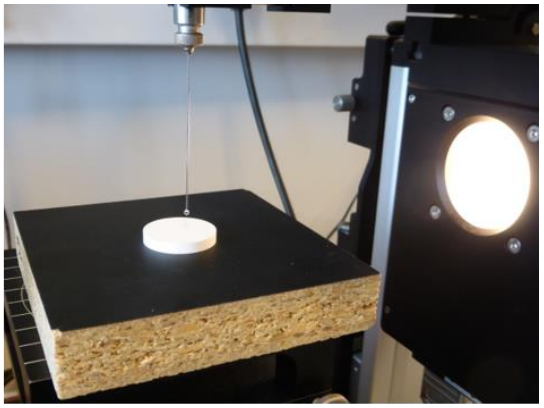
- Contact angle measurements of untreated and Plasma treated powder
- Differential Scanning Calorimetry (DSC) of untreated and Plasma treated powder
- Electrostatic powder coating trials with Plasma treated powder

Experiments

Contact angle measurements of untreated and Plasma treated powder

The contact angle measurements were made on tablet-shaped powder coating samples, since measurement on loose powder is not possible (accumulation of powder particles during measurement).



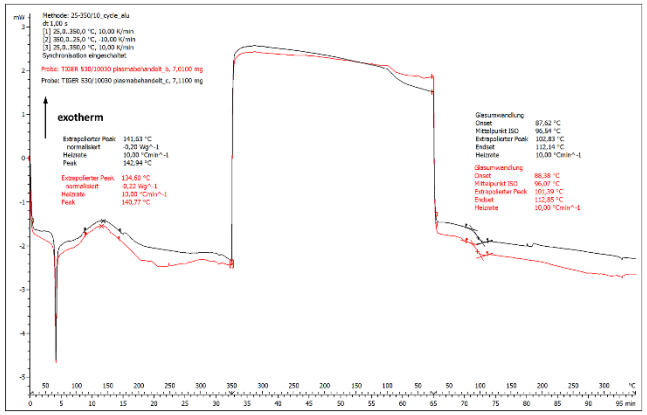


The tablets of powder coating were produced by means of a hydraulic hand press.
Afterwards the contact angle was measured using the contact angle measurement device.

No.	Sample	Free Surface Energy [mJ/m²]		
		total	dispersive	polar
1	Powder coating untreated	54,93	51,11	3,83
2	Powder coating Plasma treated	48,43	39,46	8,96

Experiments

DSC-measurement of untreated and Plasma treated powder



Untreated powder coating: Tg = 92°C
Plasma treated powder coating: Tg = 96°C
→ Shift of Tg (ΔTg = 4°C) to higher temperatures due to the plasma treatment

Electrostatic powder coating trials with Plasma treated powder

No significant difference in the electrostatic application and the curing/cross-linking properties between untreated and plasma treated powder was detected.

Experiments

PVD coating on wood-based materials

In several series of experiments, the feasibility of PVD coating on wood-based materials was investigated by plasma sputtering (University of Innsbruck)

In test series 1, a chromium (Cr) coating was deposited, in test series 2 and 3 a molybdenum (Mo) layer was deposited on the respective substrates.

The aim of the experiments was, in addition to the feasibility test, the generation of a conductivity layer on different wood-based substrates.

Row 1: MDF uncoated and coated with a molybdenum layer
Row 2: WPC uncoated and coated with a molybdenum layer
Row 3: Paper uncoated and coated with a molybdenum layer

Experiments

Characterisation tests of the PVD coating

Resistive tests:

Prosperous results were achieved for conductivity measurements and examination of the conductive effectiveness using a microcontroller board with touch and capacitive proximity switching function.

High conductivity (i.e. low resistance values) were achieved for the coated samples.

→ Uncoated substrates: $3 \cdot 10^9$ - $8 \cdot 10^{12}$ Ω
→ Molybdenum coated substrates: $1 \cdot 10^2$ - $1 \cdot 10^3$ Ω

Coating thickness measurements and cross-cut tests:

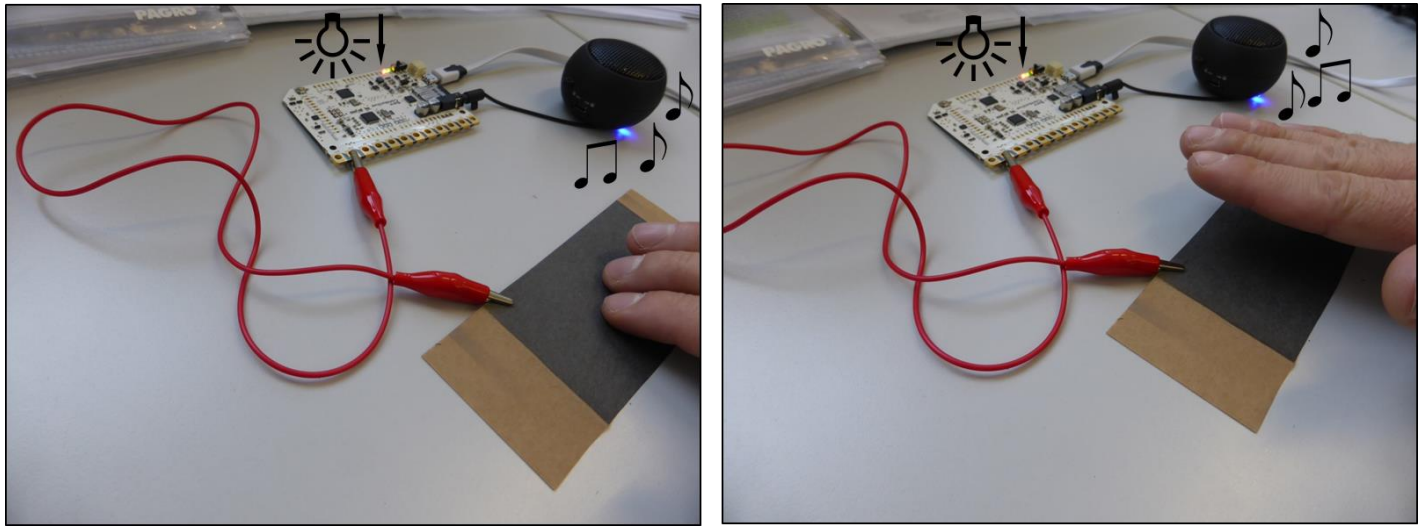
The cross-cut tests showed good results - no delamination between the coating and the substrate was detected (except the CDF, which caused chipping in the board itself).
The determination of the layer thickness by means of a microscope could only be carried out with the WPC and MDF samples, whereby layer thicknesses between about 3µm and 5µm were determined.

Experiments

Characterisation tests of the PVD coating

Microcontroller board with touch and capacitive proximity switching function:

For all tested materials the switching circuit was operating both in the touch and the capacitive proximity function.



Through conductive layer the switching function works via the touchboard (left) as well as by proximity switching function (right) - orange LED lights up, signal tones can be heard via loudspeaker