

1/2 Comparison of the abrasion resistance and hydrophobicity of a conventional finishing for furniture leather (upper half of the sample) with an ORMOCER® finishing (lower half of the sample); application: high-quality leather products

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ORMOCER® COATINGS FOR LEATHER FINISHING

Problem

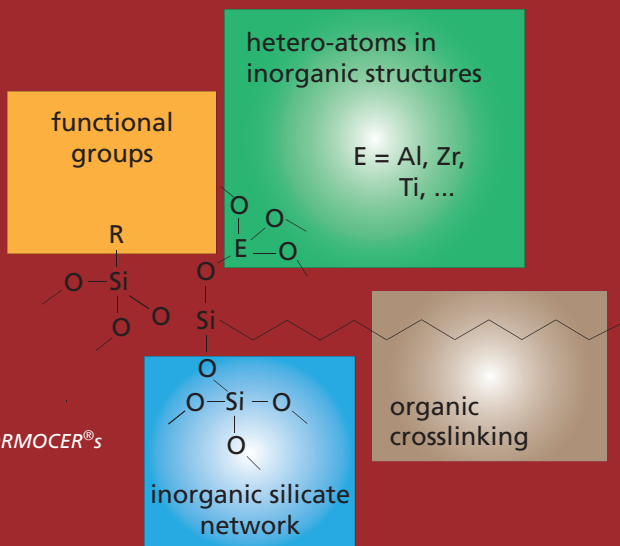
Leather is produced by tanning animal skins. Besides its attractive outer appearance leather distinguishes itself by numerous valuable properties: a high water vapor permeability and good haptic properties which makes it comfortable to wear. Therefore, leather products like clothes, bags or furniture are highly appreciated.

The requirements for its functional properties like scratch and light resistance, hydrophobic and dirt repellent characteristics, however, are increasing steadily. In spite of this, the natural character of leather has to be preserved. But even high quality leather does not fulfil these requirements in all respects.

Points of criticism:

- Sufficient abrasion or scratch resistance can only be achieved by thick polymeric protective layers. This leads to a decrease of water vapor permeability and consequently to a loss of wearing comfort.
- Not all of the desired functional properties can be achieved by the conventional ways of leather finishing (e. g. combination of hydrophobicity with high water vapor permeability).
- Besides, leather finishing is often responsible to a considerable degree for emissions (e. g. fogging) of non-bonded chemical substances out of the leather.

3 Structural units of ORMOCER[®]s
(hybrid polymers)



Solution

Novel coating systems based on ORMOCER[®]s (developed at Fraunhofer ISC) allow a thin surface protection without affecting haptic and comfort properties. ORMOCER[®]s are inorganic-organic hybrid polymers which can be adjusted to specific requirements through their chemical composition and by varying the process parameters. They are produced in a wet chemical process, where an inorganic siloxane network is built up which is further crosslinked by organic polymerization. These processes lead to stable functional coating systems.

Properties

By finishing leather with thin ORMOCER[®] coating systems (4 µm), excellent functional properties (Table 1 and Figure 1 and 2) are achieved, as for instance:

- preservation of the natural, optical and haptic properties
- distinct hydrophobicity combined with high water vapor permeability and water vapor absorption
- low emission
- excellent scratch resistance, fastness to rubbing and improved abrasion resistance
- good heat and light resistance

Moreover, ORMOCER[®] finishings have extraordinarily good permanent adhesion to leather.

Customer benefit

The leather industry and leather finishers can offer high quality products with improved functional properties and novel combinations of characteristics. Because of the excellent stability of the ORMOCER[®] finishing, these advantages can be preserved for a long time.

Table 1:
Comparison of a conventional state-of-the-art leather finishing
(layer thickness: approx. 30 µm) with an ORMOCER[®] finishing (layer thickness: 4 µm)

Parameters	State of the art	ORMOCER [®] coating	Requirements
Adhesive strength (IUF 470) [N/cm]	> 4.0	9.0	> 1.5 (furniture) > 4.0 (automobiles)
Rub fastness of top side (DIN EN ISO 11640)			
dry felt: 500 cycles	4	5	> 4
wet felt: 80 cycles	4	5	> 4
felt pH 8,0: 50 cycles	4	5	> 4
Grey scale grade 5 - 1*			
Abrasion resistance			
(according to DIN 53109) number of abrasion cycles with abrasion wheel CS 10 and load of 10 N	visible abrasion after 10-20 abrasion cycles (furniture)	slight visible abrasion after 60 cycles	no visible abrasion after 500 cycles (only for automobiles)
Fastness to water spotting (IUF 420)			
absorption time (min)	10 - 15	36	> 10
change of color	4 - 5	5	5
Grey scale grade 5 - 1*			
Parameters	State of the art	ORMOCER [®] coating	Requirements
Water vapor permeability (DIN 53333) [mg/cm ² h]	0.8 - 1.5	9	> 1.5 (automobiles) 2.0 (furniture)
Water vapor absorption (DIN EN 344) [mg/cm ²] during 8 h	4.6 - 5.8	21	8.0 (furniture)
Emission (VDA 277) [µgC/g]	300 - 1000	113 - 223	< 100
Fogging (VDA 75201) [mg/50 cm ²]	5-10	3 - 4	< 5 (automobiles)
Thermal stability (TL 52064)	> 3 - 4	> 3 - 4	> 3 - 4 (automobiles)
Grey scale grade 5 - 1*			
Light stability (DIN 54004)	5 - 6	5 - 6	5
Blue scale grade 6 - 1**			

*5 (best) - 1 (worst)

**6 (best) - 1 (worst)