

Surface Characterization of Coated and Uncoated Float Glass

Kasper Weirum Risgaard¹, Peter Fojan¹, Rasmus Lund Jensen², and Leonid Gurevich^{1}*

¹) Department of Physics and Nanotechnology, Aalborg University, Aalborg, Denmark

²) Department of Civil Engineering, Aalborg University, Aalborg, Denmark

^{*}) E-mail: lg@nano.aau.dk

Surface coating on float glass has become standard in the production of window panes, where especially low-emission coatings are used to reduce the radiative heat loss through the windows. However, coatings may also be utilized to control the formation of condensation on the window panes [1]. In this respect we have determined the effect of two different silane coatings on the float glass hydrophilicity/hydrophobicity and on the surface roughness, as these parameters affects the condensation [2]. Hence, we have measured the advancing and receding water contact angles (CA) by the sessile drop method and the RMS surface roughness by atomic force microscopy (AFM). The silane coatings used were (3-aminopropyl)trimethoxysilane (APTMS) and 1H,1H,2H,2H-Perfluorodecyltriethoxysilane (PFOTES) deposited by chemical vapour deposition.

Initially, the two sides of the uncoated float glass were examined and no differences in CA and RMS surface roughness were observed, as can be observed in Table 1 showing that they were both hydrophilic. However, the sides can be distinguished by the fact that small indentations are observed in the AFM images (Figure 1) on only one side. Furthermore, energy dispersive X-ray spectroscopy revealed that this side of the glass contained trace amounts of tin, whereas the other side did not (data not shown). In the production of float glass the molten glass floats on a bath of molten tin to form a level surface, and it is hypothesized that the tin on the one side may be deposited during this production step and furthermore the indentations may also be caused by the tin bath.

Coating of the glass with APTMS renders the glass more hydrophobic, though the receding contact angle is not increased significantly as compared to the uncoated glass. The surface roughness is, however, observed to increase dramatically. Coating of the glass with PFOTES renders the glass even more hydrophobic, whereas the surface roughness does not increase as much. It may therefore be concluded that the two silane coatings can be used for manipulation of surface wettability and roughness of float glass. However, the durability of the coatings needs to be tested.

Table 1: Surface characteristics of uncoated and silane coated float glass.

Sample	Advancing / Receding Contact Angle [°]	RMS Roughness [nm]
Uncoated, air side	28±6 / 7±2	0.4 ± 0.3
Uncoated, tin side	24±3 / 6±2	0.7 ± 0.4
APTMS coated, tin side	47±4 / 11±7	36.3 ± 16.0
PFOTES coated, tin side	105±1 / 84±1	6.8 ± 1.4

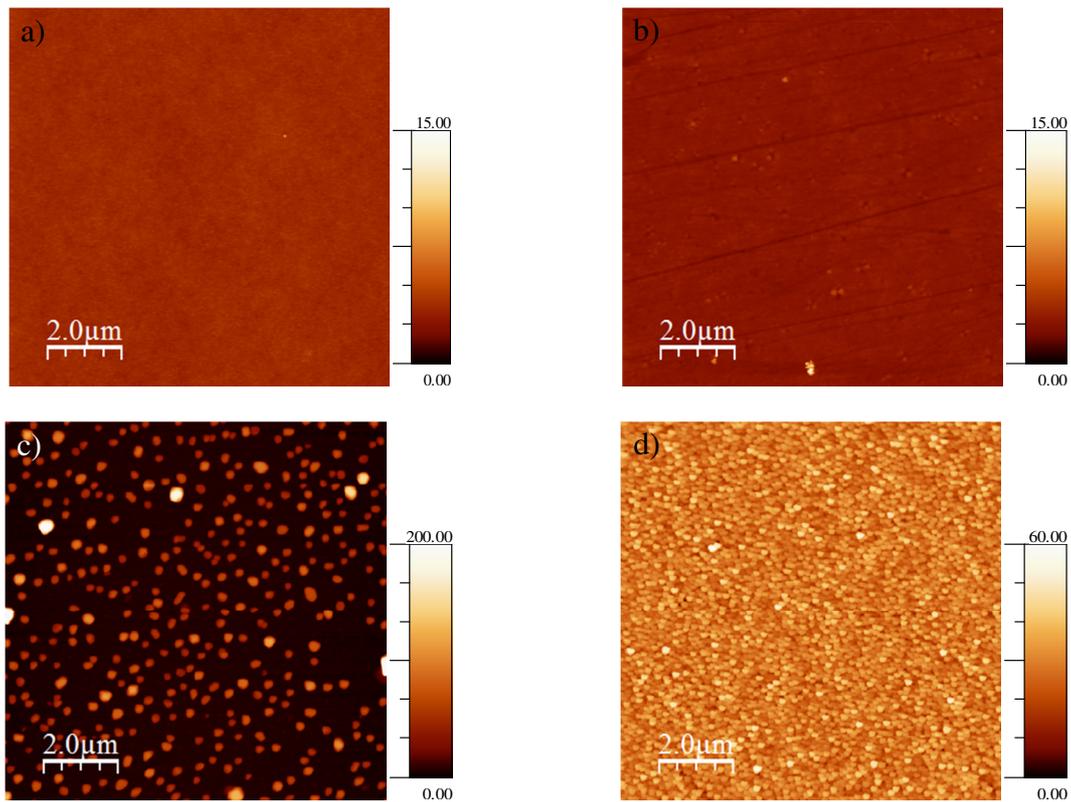


Figure 1: AFM images of float glass. a) Air side of uncoated glass. b) Tin side of uncoated glass. c) Tin side of APTMS coated glass. d) Tin side of PFOTES coated glass.

References.

- [1] A. Werner, A. Roos, *Sol. Energy Mater. Sol. Cells* **91**, 609-615 (2007).
- [2] K. R. Jensen, P. Fojan, R. L. Jensen, L. Gurevich, *J. Nanosci. Nanotechnol.* **14**, In Press (2014).