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Fabrication of a robust, transparent, and superhydrophobic soda-lime glass

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Micro- and nanoscale texturing and control of surface energy have been considered for superhydrophobicity on polymer and silicon. However these surfaces have been reported to be difficult to meet the robustness and transparency requirements for further applications, from self cleaning windows to biochip technology. Here we provided a novel method to fabricate a nearly superhydrophobic soda-lime glass using two-step method. The first step involved wet etching process to fabricate micro-sale patterns on soda-lime glass. The second step involved application of SiO_x-incorporated DLC to generate high intrinsic contact angle on the surface using chemical vapor deposition (CVD) process. To investigate the effect of surface roughness, we used both positive and negative micro-scale patterns on soda-limeglass, which is relatively hard for surface texturing in comparison to quartz or Pyrex glasses due to the presence of impurities, but cheaper. For all samples we tested the static wetting angle and transparency before and after 100 cycles of wear test using woolen steel. The surface morphology is observed using optical and scanning electron microscope (SEM).

The results shows that negative patterns had a greater wear resistance while the hydrophobicity was best achieved using positive patterns having static contact angle up to 140 deg. with about 80% transparency. The overall experiment shows that positive patterns at etching time of 1 min shows the optimum transparency and hydrophobicity. The optimization of micro-scale pattern to achieve a robust, transparent, superhydrophobic soda-lime glass will be further investigated in the future works.