Development of antireflective coatings for automotive glazing by wet chemical processing

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A wet chemical coating technique for dielectric multilayers with antireflective (AR) properties on automotive glazing has been developed. The coating solutions consist of SiO_2 and TiO_2 nanoparticles of 10 nm and 4 nm respectively in isopropanol which carry epoxysilane surface ligands. Batches of 100 l are prepared in appropriate reactors under controlled conditions. A 4- layer AR system is deposited on side 1 and side 4 of an automotive windscreen by dip coating with constant withdrawal speeds. Each single layer is cured for 5 minutes at 120°C. Finally, the whole AR stack is fired at 450°C for 1 h, leading to a homogeneous bluish residual reflectance. The design of the AR stack had been optimized for flat angles of incidence by computer simulation, in order to minimize reflections from the dashboard into the drivers view. Therefore, a residual reflectance of about 2 % to 4 % is obtained for perpendicular incidence in the range from 490 nm to 700 nm wavelength. For an incident angle of 60°, the reflectance is decreased from 15 % (uncoated) to 6 % and for an angle of 65° from 20 % to 10 %.
The coatings show the same scratch hardness as uncoated glass in taber abrasor tests, and no degradation is observed in salt water boiling test for more than 11 days and UV test for more than 340 h.

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