Importance of nanosized sol-gel coatings for glass technology

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Glass is a material with a very long history. It is increasingly used in every-day life, and both privacy and industry would be impossible without glass. However, there are many demands today where ordinary glass would fail. This is the reason why coatings with specific properties are needed, and the sol-gel technology is getting increasing importance in this respect.

In recent years we studied the preparation and performance of different nanosized sol-gel coatings on glass substrates. Thus, for example, $BaO\text{-}TiO_2\text{-}SiO_2$ coatings of 60 to 200 nm thickness, prepared by dip-coating, strongly protect glass surfaces against alkaline attack. Sol-gel prepared Al_2O_3 (corundum) coatings on float glass enhance the scratch resistance without decreasing the optical transmission in the visible wavelength range. Indium tin oxide (ITO) coatings show high transmission in the visible range, high infrared reflection and low electrical resistivity. Because of these properties ITO films are widely used as transparent electrodes in displays, solar cells and in many other electronic and optoelectronic applications. It has been shown that the sol-gel technique is a powerful means to develop such coatings. On the other hand, broad-band and low-cost antireflection coatings are necessary for solar collector covers. Porous SiO_2 coatings of ≈ 100 nm thickness, prepared by the dip-coating process with silica sol as a precursor, can increase the transmittance of float glass up to 99 %.

Several examples are discussed which show the applicability of the sol-gel technology to tailor such innovative nanosized coatings on glasses.