Ellipsometric study of the TiO_2-based decorative coatings produced using magnetron sputtering technique at industrial conditions

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Titanium dioxide is a non-toxic, biocompatible and chemically stable material and is used as white pigment in paints and some high-tech applications including electrochromic devices, dye-sensitized solar cells (DSSC), photocatalysis, optical filters and antireflection coatings.

Moreover, due to the expressive colors of titanium oxides and oxynitrides deposited/formed on metal or metal-coated glass, these compounds can be applied as a decorative material for architecture, automotive industry, electronics and jewelry. In general, titanium dioxide is a non-absorbing material in the visible spectral range, thus the color effect is caused by the optical interference of light in the thin dielectric film.
In the last few years, the different TiO_2-based decorative coatings were produced using a industrial scale magnetron sputtering line and were analyzed at Institute of Mathematics and Physics UTP. The decorative coatings were deposited on glass, aluminum, Ti-coated aluminum, stainless steel, Ti-coated stainless steel, ceramic tiles as well as on polymer substrates. The presented results will be a summary of the last few years of research. These results show that for the opaque systems the color of sample can be related to thickness of the TiO_2 layer. The thickness of Ti film in TiO_2/Ti/glass samples is associated with their transparency, whereas in TiO_2/Ti/Al specimens - with saturation of color.

Keywords: TiO_2, decorative coatings, intereference, thin films

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