

FABRICATION AND CHARACTERIZATION OF TITANIA-NANOSHEET FILM BY ELECTROPHORETIC DEPOSITION TECHNIQUE

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Two-dimensional nanosheets, such as graphene and some oxides, have been investigated because of their unique functional properties. Titania is known as a key material showing a photocatalytic activity as well as a superhydrophilicity by irradiation of ultraviolet light. General preparation method for titania nanosheets has already been reported by Sasaki *et al.* in 1998.[1] On the other hand, an electrophoretic deposition (EPD) process of colloidal particles in a suspension has been used in various systems in order to create some functional materials and/or devices. In this work, we demonstrate a fabrication of film consisting of titania nanosheet by the simple EPD technique.

Titania-nanosheet aqueous suspension was prepared according to the previous report [1]. Dried titania nanosheet powder was obtained to avoid electrolysis of water during EPD process. The dried titania nanosheet powder dispersed in acetone was used as the suspension for the EPD process. The EPD was carried out a constant d.c. voltage mode of 20 V for 300 s. An indium-tin oxide (ITO)-coated glass and a stainless steel plate was used as the anode and cathode, respectively. The two electrodes placed parallel to each other in the suspension. The distance of the electrodes was fixed at 5 mm. The deposition area was set to be 13 mm x 8 mm. The electrophoretically-deposited film was characterized by scanning electron microscope (SEM).

Figure 1 shows a photograph of the electrophoretically-deposited film onto the ITO-coated glass substrate (anode). Relatively uniform deposit without cracks was observed onto the substrate. The zeta-potential of the titania nanosheets in the EPD suspension was -37.2 mV. Figure 2 shows SEM microphotograph of the sample obtained by the EPD process. It was clearly observed that the titania nanosheet was deposited onto the ITO-coated glass substrate. The thickness of the film was approximately 340 nm. It is concluded that the laminated thin film of titania nanosheets was successfully fabricated onto the ITO-coated glass electrode substrate by using facile EPD process under the optimized EPD conditions.

Reference

[1] T. Sasaki and M. Watanabe, J. Am. Chem. Soc., 120, 4682 (1998).



Figure 1 Photograph of electrophoretically-deposited titania-nanosheets film onto ITO-coated glass substrate (anode). The deposit area was 13 mm x 8 mm.

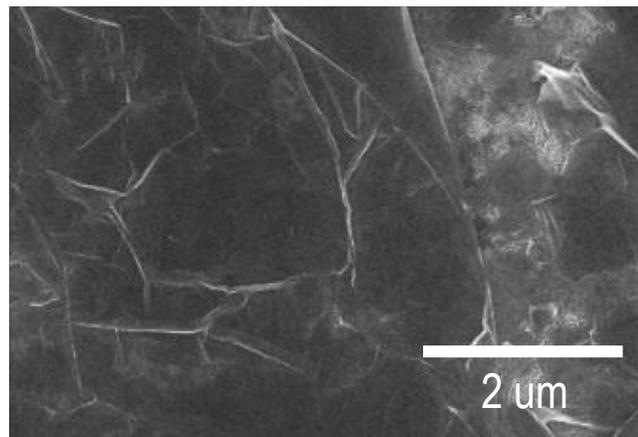


Figure 2 SEM image of electrophoretically-deposited titania-nanosheets film onto ITO-coated glass substrate.