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Preparation and characterization of Fe-doped TiO₂ thin layers

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Abstract

Fe-doped TiO₂ thin layers were prepared by the sol-gel technique controlled in the reverse micellar environment. Sol-gel Fe-doped TiO₂ layers were deposited on a substrate by the dip-coating method. For comparison the same techniques were used for preparation of pure TiO₂ layers.

The pure titania sol was prepared from nonionic surfactant (Triton X-102), cyclohexane, water and metal precursor (titanium isopropoxide, TIOP). For the Fe-TiO₂ preparation the iron solution was used instead of pure distilled water. As sources of iron iron (III) nitrate (Fe(NO₃)₃·9H₂O) and iron (II) sulphate (FeSO₄·7H₂O) were used. Then all types of prepared pure and Fe-doped TiO₂ layers were deposited on a substrate by the dip-coating method. To obtain the series of 1, 2, and 3 layers on a glass substrate the repeated dip-coating was applied by the laboratory dip-coater. The deposited sol on substrates were dried on air and then the organic matter was removed by calcination. The calcination was carried out at 450 °C for four hours to obtain the crystalline structure of pure anatase and mixed phase of hematite/anatase. The structural properties of the prepared layers were characterized by series of methods involving Raman spectroscopy UV-Vis spectrophotometry and SEM.

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