

钛金属有机物热解制备TiO₂-SiO₂复合膜及其光催化活性研究

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摘要 混有一定量SiO₂溶胶的钛金属有机化合物膜液通过旋液成膜法制备前驱物膜,经热解得到TiO₂-SiO₂复合膜。于610℃焙烧15min所得复合膜(Ti:Si=9:1)经SEM, XRD, UV-vis和XPS研究表明,膜面由30 nm * 200 nm大小的晶体粒子组成,结构致密,膜厚约200 nm,其可见光透过率为玻璃基质的80%,膜表面Ti~(3+)/OH~的比值为1.06。对不同SiO₂含量的膜液凝胶进行DSC分析显示,少量的SiO₂就能显著提高TiO₂锐钛矿型晶相的形成温度。膜的光催化活性研究表明一定量的Fe~(3+)有利于提高膜的光催化活性,但是如果以氯化物的形式加入则对光催化反应不利,铬的氯化物同样如此。另外,

在钛金属有机物热解制备TiO₂-SiO₂复合膜中,溶胶SiO₂不利于光催化反应,但是它可以改善膜的耐磨性。

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Preparation and Photo-catalytic Activity of TiO₂-SiO₂ Thin Films by Pyrolysis of Organo-Titanium Compounds

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Abstract TiO₂-SiO₂ composite thin films can be obtained by calcinating the precursor films prepared with spin-coating that comprise organo-titanium compounds and SiO₂ sol. The film sample (Ti: Si = 9: 1) obtained through calcinating at 610 °C for 15 min was studied with SEM, XRD, UV-vis and XPS. The research results show that the film is made up with about 30 nm x 200 nm crystalline particles densely with its thickness of about 200 nm, transmittance rate of visible light is 80% of that of glass substrate and the Ti~(3+)/OH~ ratio on surface of the composite thin film is 1.06. The formation temperature of anatase phase could be elevated markedly by mixing a small quantity of SiO₂, which was confirmed by DSC analysis of the gel of film solutions containing different amounts of SiO₂. The studies on photo-catalytic activities of the films revealed that doping certain amount of Fe~(3+) (not in chloride form) is in favor of photo-catalytic reaction. The same holds true in doping Cr~(3+). In addition, mixing SiO₂ can improve the abrasability of films, although it adversely affects the photo-catalytic activities.

Key words [TITANIUM OXIDE](#) [SILICON OXIDE](#) [PHOTOCATALYSIS](#) [THERMOLYSIS](#) [SEM](#) [XRD](#) [UV](#) [XPS](#)

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