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Abstract
In this research, TiO2 and TiO2-xNx thin films were deposited onto (100) n+-silicon and ITO/glass substrates by radio frequency magnetron sputtering. We changed deposition power, substrate temperature, sputtering pressure, argon flow-rate, oxygen flow-rate, and nitrogen flow-rate to find out the optimum sputtering conditions. The relationships among the processing parameters, film structures, and photocatalystic properties were explored in this study.The results indicate that the crystalline TiO2 thin films can be grown at ambient temperature. The XRD results show that the TiO2 thin films are anatase phase with (101) preferential growth. As the substrate temperature was increased, the phase of the TiO2 thin films was changed from anatase to mixture of anatase and rutile, and the grain size was also increased. It was found that the TiO2 thin films grown at temperature below 300OC are well-crystallized anatase phase and exhibited excellent photocatalystic performance under ultraviolet light irradiation. In this research, the result shows that the optimum sputtering conditions for the films deposited at ambient temperature are oxygen mixture ration（OMR）of 20% , working pressure of 6 mtorr and power of 200W. The second part of this study focuses on the TiO2-xNx thin films. The XRD results show that nitrogen dopants will enhance the formation of rutile phase at a high substrate temperature. In this research, the best photocatalystic activity of TiO2-xNx was obtained at nitrogen gas ratio of 40%.
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